1.3.4 students undertaking field projects / student projects/internships (Data for the latest completed academic year)

Field-Project				
Programme name	Program Code	Name of students undertaking field projects /internships/student projects	Title	Place
CIVIL ENGINEERING	CV	RAMAN SUDHEER DEVDAS	Extensive Survey Project	Bagalkote
		AKSHAY HANAMAGOUDA MALAGOUDAR	Extensive Survey Project	
		MAHANTESH PARASHURAM NAIKAR	Extensive Survey Project	
		MANJUNATH B LUTIMATH	Extensive Survey Project	
		SAGAR BANNI	Extensive Survey Project	
		AMRUT	Extensive Survey Project	
		ASHWINI MALLIKARJUN HALAWAR	Extensive Survey Project	
		MAHANTESH ANGADI	Extensive Survey Project	
		SAGAR SURESH BAJANTRI	Extensive Survey Project	
		SANJEEV A PATIL	Extensive Survey Project	
		VIJAY M	Extensive Survey Project	
		VINAYAK S CHIMMALAGI	Extensive Survey Project	
		AAKASH ANCHI	Extensive Survey Project	
		ABHISHEK M RATHOD	Extensive Survey Project	
		ABHISHEK R YELADAGI	Extensive Survey Project	
		ADARSH MADABHAVI	Extensive Survey Project	
		AMBIKA VITLAPUR	Extensive Survey Project	
		AMIT B GENNUR	Extensive Survey Project	
		AMITHGOUDA R PATIL	Extensive Survey Project	
		AMRUTA BADDUR	Extensive Survey Project	
		ANAND	Extensive Survey Project	
		ANJALI	Extensive Survey Project	
		ARPITA HIREMATH	Extensive Survey Project	
		ASHA TALAGADE	Extensive Survey Project	
		AYESHASULTANA	Extensive Survey Project	
		BASAVARAJ HORAKERI	Extensive Survey Project	
		BASAVARAJ MANTUR	Extensive Survey Project	
		CHAITRA MUDHOL	Extensive Survey Project	
		CHAYA T RATHOD	Extensive Survey Project	
		CHETANKUMAR PATTAR	Extensive Survey Project	
		DARSHAN MAHALINGPUR	Extensive Survey Project	
		DARSHANKUMAR SHASHIKANT JAGALI	Extensive Survey Project	
		GANDLA SUJITH BHUSHAN	Extensive Survey Project	
		GOURAMMA BUGUDI	Extensive Survey Project	
		GURUPRASAD BALAGI	Extensive Survey Project	
		HARSHITA MARUTI JOGIN	Extensive Survey Project	
		HEBBALAPPA NAIK	Extensive Survey Project	
		IBRAHIM MULLA	Extensive Survey Project	

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SANGAMESH D BIRADAR	Extensive Survey Project
SANJEEV MINAJAGI	Extensive Survey Project
SANTOSH CHANAGOND	Extensive Survey Project
SAPNA GURURAJ RATHOD	Extensive Survey Project
SAROJA GURAVA	Extensive Survey Project
SHEFALI S BELLARY	Extensive Survey Project
SHRIDHAR DASAR	Extensive Survey Project
SHWETA TODALABAGI	Extensive Survey Project
SIDARAY GODIHAL	Extensive Survey Project
SIDDU MALLAPPA KALAGUDI	Extensive Survey Project
SOMANATH	Extensive Survey Project
SUDEEP	Extensive Survey Project
SUSHMITA BIRADAR	Extensive Survey Project
SUVARNA NYAMGOUDA	Extensive Survey Project
SWAPNA S BASSANUR	Extensive Survey Project
SWAROOPA	Extensive Survey Project
SWATI B MIRJI	Extensive Survey Project
TARIWAL SHEETAL SUNIL	Extensive Survey Project
T.VISHMITHA	Extensive Survey Project
VASANT B NINGARADDI	Extensive Survey Project
VEDA PATIL	Extensive Survey Project
VEENA BIRADAR	Extensive Survey Project
VEERESH NAGAPPA HUNAGUND	Extensive Survey Project
VEERESHGOUDA HALEMANI	Extensive Survey Project
VIJAYALAXMI NIDONI	Extensive Survey Project
VISHALAKSHI HIREMATH	Extensive Survey Project
VISHWANATH S WADDAR	Extensive Survey Project
PASANG TSERING	Extensive Survey Project
TARH TAYANG	Extensive Survey Project
IZAZAHMED MAKUTMSAB BALIKAI	Extensive Survey Project
RAGHAV R BHATTAD	Extensive Survey Project
AISHWARYA VASANT WAGH	Extensive Survey Project
AKSHAY BASUTKAR	Extensive Survey Project
ASHWINI ALABAL	Extensive Survey Project
ASIF MAJEED	Extensive Survey Project
BABU RANGAPPA KAMBAR	Extensive Survey Project
BHAVANA P BHIRDE	Extensive Survey Project
FAIZAN NAZIR	Extensive Survey Project
HEENAKOUSAR SAIYYAD	Extensive Survey Project
JAVID AHMAD MIR	Extensive Survey Project
JAYASHREE S JOGIN	Extensive Survey Project
KALAPPA	Extensive Survey Project
KARTHIK SHEELAVANTAR	Extensive Survey Project

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Internship				
Programme name	**Program Code**	**Name of students undertaking field projects /internships/student projects**	**Title**	**Place**
BIOTECHNOLOGY	BT	ADITI SHRIDHAR KULKARNI	BEC-STEP	Bagalkote
		KALLAYYA	Sudha Algae	Bagalkot
		PRATHAMESH DILIP CHOPADE	Natura Crop Care	Bangalore
		SHRUTI KSHATRI	BEC-STEP	Bagalkote
		ABHISHEK DESAI	Sudha Algae	Bagalkot
		AMRUTH DEEPAK BHAT	T3 - MGen Pvt Ltd	Bangalore
		ANUSHA B KAWATAL	Cytoxn Biosolutions PVT Ltd	Hubli
		CHAITANYA SANJAY KAGWADE	Sudha Algae	Bagalkot
		KALPANA SOMAPPA LAMANI	Stroma Biotechnologis,	Bangalore
		KRUTI N NIMBARAGI	Cytoxn Biosolutions PVT Ltd	Hubli
		NEHA ALLABHAKSHA BAGAWAN	Natura Crop Care	Bangalore
		PAVANAKUMAR	Natura Crop Care	Bangalore
		PAVITRA IRANNA KATAGERI	Stroma Biotechnologis,	Bangalore
		PRATIKSHA P RUDRAKSHI	Mylan Laboratories Limited	Bangalore
		SANA SAYED IDDALAGI	Stroma Biotechnologis,	Bangalore
		SHAKTI ISHWARGOUDA PATIL	Natura Crop Care	Bangalore
		SHANKARAGOUDA PATIL	Natura Crop Care	Bangalore
		SHREENIDHI S JAHAGIRADARA	Natura Crop Care	Bangalore
		SHREERANG MUTALIK	Natura Crop Care	Bangalore
		SHREYA SATYANARAYAN BHAT	Cytoxn Biosolutions PVT Ltd	Hubli
		SPOORTHI R KULKARNI	Cytoxn Biosolutions PVT Ltd	Hubli
		VARSHA CHANDRASHEKHAR KACHATTI	Natura Crop Care	Bangalore
		YUKTA S HANDRAL	Mylan Laboratories Limited	Bangalore
INDUSTRIAL & PRODUCTION ENGINEERING	IP	MALLIKARJUN L SAVADI	Not completed	
		SHRIKANT SAYABANNA TENNEHALLI	CNC Operations	(NASD)Ambewadi, Baarchi road,near Ganapati temple, Dandeli-581325
AUTOMOBILE ENGINEERING	AU	ABHIJEET MANAHALLI	Parishrama Motors, Bagalkot	Bagalkot
		AJAYKUMAR ITAGI	Programming with Python (Online) Intershala	Online
		AMAN AGARWAL	VTU National Academy for Skill Development Training Centre, Dandeli	Dandeli
		AVINASH R DODAMANI	Programming with Python (Online) Intershala	Online
		GURUNATH GHORPADE	VTU National Academy for Skill Development Training Centre, Dandeli	Dandeli
		SHARAT BASAVARAJ KOULAGI	Programming with Python (Online) Intershala	Online
		SHREEDHAR VISHWAKARMA	Programming with Python (Online)Intershala	Online

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GURURAJ TIMMAPPA NAIK	On Industry 4.0	Hosur
ISHWARI	On Industry 4.0	Hosur
KARTIK A MASHAL	IOT , Machine Learning & Deep Learning	Bangalore
KASHINATH	IOT , Machine Learning & Deep Learning	Bangalore
MADHUMATI SAJJAN	On Industry 4.0	Hosur
MAHIMA S PATIL	IOT , Machine Learning & Deep Learning	Bangalore
MARULASIDDESH HANDI	On Industry 4.0	Hosur
MEGHA	IOT , Machine Learning & Deep Learning	Bangalore
MOUNESH	On Industry 4.0	Hosur
NETRA S TEGGINAMANI	On Industry 4.0	Hosur
NETRAVATI GABBUR	On Industry 4.0	Hosur
NIKHIL VITHAL GHORPADE	Cyber Security	Bangalore
NISHAT CHIKKODI	IOT , Machine Learning & Deep Learning	Bangalore
POOJA CHANAPANNAVAR	Advance JAVA	Jaipur
POOJA GUNJAL	IOT , Machine Learning & Deep Learning	Bangalore
POOJA KUDARIMANI	On Industry 4.0	Hosur
POOJA V DHONGADI	Web Development	Bihar
PRADYUMNA SAVADATTI	Machine Learning/ Data Science	Bangalore
PRAJWAL KALLOLI	Android App Development	Lucknow
PRAMODKUMAR PATIL	On Industry 4.0	Hosur
PRATIBHA CHIDAMBAR KULAKARNI	Web Development	Vijayapur
PRATIKSHA HUDDAR	IOT , Machine Learning & Deep Learning	Bangalore
PREETI PATIL S N	IOT , Machine Learning & Deep Learning	Bangalore
PURNIMA HANUMANT CHABBI	On Industry 4.0	Hosur
RAGINI P ANVEKAR	IT intern	Maharashtra
RAHUL H PATIL	On Industry 4.0	Hosur
RAKSHIT A CHOPADE	On Industry 4.0	Hosur
RAKSHIT G PAWAR	IOT , Machine Learning & Deep Learning	Bangalore
RANJITA MADARI	Advance JAVA	Jaipur
RAVIKANT BHUSHANNAVAR	On Industry 4.0	Hosur
ROOPA KUNIJADAR	Advance Java	Jaipur
SAMREEN IQBAL MUJAWAR	On Industry 4.0	Hosur
SANJEEV BHIMASEN KULKARNI	Web Development	Bangalore
SHRAVAN VIJAYKUMAR MUNGARWADI	Python with Django	Bangalore

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		SUSHMITASHRI S BHOSALE	IOT , Machine Learning & Deep Learning	Bangalore
		VIJAYALAXMI BASAVARAJ KATAGI	Advance JAVA	Jaipur
		VISHWANATHA NARA	Advance JAVA	Jaipur
CIVIL ENGINEERING	CV	RAMAN SUDHEER DEVDAS	Construction of Commercial Building	Bagalkot
		AKSHAY HANAMAGOUDA MALAGOUDAR	Construction of Hospital Building	Bagalkot
		MAHANTESH PARASHURAM NAIKAR	Drafting and Annotation	Bagalkot
		MANJUNATH B LUTIMATH	Construction of Hospital Building	Bagalkot
		SAGAR BANNI	Construction of Road	Belgavi
		AMRUT	Construction of Commercial Building	Bagalkot
		ASHWINI MALLIKARJUN HALAWAR	Construction of Residential Building	Bagalkot
		MAHANTESH ANGADI	Construction of Hospital Building	Bagalkot
		SAGAR SURESH BAJANTRI	Construction of Residential Building	Bagalkot
		SANJEEV A PATIL	Construction of Residential Building	Bagalkot
		VIJAY M	Construction of Residential Building	Bagalkot
		VINAYAK S CHIMMALAGI	Construction of Residential Building	Bagalkot
		AAKASH ANCHI	Construction of Residential Building	Bagalkot
		ABHISHEK M RATHOD	Construction of Aquaduct	Alamatti
		ABHISHEK R YELADAGI	Construction of Residential Building	Bagalkot
		ADARSH MADABHAVI	Construction of Commercial Building	Bagalkot
		AMBIKA VITLAPUR	Construction of Commercial Building	Bagalkot
		AMIT B GENNUR	Construction of Residential Building	Bagalkot
		AMITHGOUDA R PATIL	Construction of Commercial Building	Bagalkot
		AMRUTA BADDUR	Construction of Road	Bagalkot
		ANAND	Construction of Residential Building	Bagalkot
		ANJALI	Construction of Residential Building	Bagalkot
		ARPITA HIREMATH	Construction of Commercial Building	Bagalkot
		ASHA TALAGADE	Construction of Hospital Building	Bagalkot
		AYESHASULTANA	Drafting and Annotation	Bagalkot
		BASAVARAJ HORAKERI	Construction of Hospital Building	Bagalkot
		BASAVARAJ MANTUR	Construction of Road	Belgavi
		CHAITRA MUDHOL	Construction of Commercial Building	Bagalkot
		CHAYA T RATHOD	Construction of Residential Building	Bagalkot
		CHETANKUMAR PATTAR	Construction of Hospital Building	Bagalkot
		DARSHAN MAHALINGPUR	Construction of Residential Building	Bagalkot
		DARSHANKUMAR SHASHIKANT JAGALI	Construction of Commercial Building	Bagalkot
		GANDLA SUJITH BHUSHAN	Construction of Road	Belgavi
		GOURAMMA BUGUDI	Construction of Hospital Building	Bagalkot
		GURUPRASAD BALAGI	Construction of Residential Building	Bagalkot
		HARSHITA MARUTI JOGIN	Construction of Residential Building	Bagalkot
		HEBBALAPPA NAIK	Construction of Residential Building	Bagalkot
		IBRAHIM MULLA	Construction of Residential Building	Bagalkot
		KALMESH KARIBHIMAGOL	Construction of Residential Building	Bagalkot

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SANJEEV MINAJAGI	Construction of Residential Building	Bagalkot
SANTOSH CHANAGOND	Construction of Hospital Building	Bagalkot
SAPNA GURURAJ RATHOD	Construction of Drainage work	Bagalkot
SAROJA GURAVA	Construction of Hospital Building	Bagalkot
SHEFALI S BELLARY	Construction of Residential Building	Bagalkot
SHRIDHAR DASAR	Construction of Road	Belgavi
SHWETA TODALABAGI	Construction of Hospital Building	Bagalkot
SIDARAY GODIHAL	Construction of Road	Belgavi
SIDDU MALLAPPA KALAGUDI	Construction of Road	Belgavi
SOMANATH	Construction of Residential Building	Bagalkot
SUDEEP	Construction of Residential Building	Vijayapura
SUSHMITA BIRADAR	Construction of Residential Building	Bagalkot
SUVARNA NYAMGOUDA	Construction of Hospital Building	Bagalkot
SWAPNA S BASSANUR	Construction of Canal	Vijayapura
SWAROOPA	Construction of Residential Building	Bagalkot
SWATI B MIRJI	Construction of Drainage work	Bagalkot
TARIWAL SHEETAL SUNIL	Construction of Road	Belgavi
T.VISHMITHA	Construction of Road	Belgavi
VASANT B NINGARADDI	Construction of Road	Belgavi
VEDA PATIL	Cement Mixing Plant	Bagalkot
VEENA BIRADAR	Construction of Residential Building	Bagalkot
VEERESH NAGAPPA HUNAGUND	Construction of Road	Belgavi
VEERESHGOUDA HALEMANI	Construction of Road	Bagalkot
VIJAYALAXMI NIDONI	Construction of Residential Building	Bagalkot
VISHALAKSHI HIREMATH	Cement Mixing Plant	Bagalkot
VISHWANATH S WADDAR	Town planning	Bagalkot
PASANG TSERING	Construction of Residential Building	Bagalkot
TARH TAYANG	Construction of Residential Building	Bagalkot
IZAZAHMED MAKUTMSAB BALIKAI	Town planning	Bagalkot
RAGHAV R BHATTAD	Construction of Residential Building	Bagalkot
AISHWARYA VASANT WAGH	Construction of Residential Building	Bagalkot
AKSHAY BASUTKAR	Cement Mixing Plant	Bagalkot
ASHWINI ALABAL	Construction of Residential Building	Bagalkot
ASIF MAJEED	Construction of Residential Building	Bagalkot
BABU RANGAPPA KAMBAR	Town planning	Bagalkot
BHAVANA P BHIRDE	Construction of Commercial Building	Bagalkot
FAIZAN NAZIR	Construction of Road	Belgavi
HEENAKOUSAR SAIYYAD	Construction of Canal	Vijayapura
JAVID AHMAD MIR	Construction of Residential Building	Bagalkot
JAYASHREE S JOGIN	Construction of Canal	Vijayapura
KALAPPA	Construction of Commercial Building	Bagalkot
KARTHIK SHEELAVANTAR	Construction of Road	Bagalkot
KOTRESH B MARALI	Town planning	Bagalkot

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Anup Purohit	Internet of Things	Kaashiv Infotech, 16/1, 1st floor, Radial Colony, next to Chennai Public School, Collector Nagar, Anna Nagar West Extension, Chennai
Anupama Kalahal	Industry 4.0	Gustovalley, Bengaluru
Anvesh Hiremath	Industry 4.0	Gustovalley, Bengaluru
Ashika Malagi	Industry 4.0	Gustovalley, Bengaluru
Ashwini Badiger	Industry 4.0	Gustovalley, Bengaluru
Ashwini Bhagavati	Industry 4.0	Gustovalley, Bengaluru
Ashwini Teggi	Industry 4.0	Gustovalley, Bengaluru
Banashankari	Industry 4.0	Gustovalley, Bengaluru
Bhagya M. Chengta	C - Programming and it's Applications	Internshipwala Careers, bangalore
Bhavya Hugar	Industry 4.0	Gustovalley, Bengaluru
Brunda D	Industrial iot, machine learning and deep learning	Vi Solutions, Bengaluru
Deepa H Bhajantri	Industrial IOT-Machine and Deep learning.	Vi Solutions, Bengaluru
Deepu Nadamani	Industry 4.0	Gustovalley, Bengaluru
Dinakar Y	Industry 4.0	Gustovalley, Bengaluru
Gavisiddesh Prakash Hesarur	Industry 4.0	Gustovalley, Bengaluru
GEETHA M	Industry 4.0	Gustovalley, Bengaluru
Gopal Suresh Koppal	Industry 4.0	Gustovalley, Bengaluru
Harshita patil	Industry 4.0	Gustovalley, Bengaluru
Ishwargouda B Abbigeri	Industry 4.0	Gustovalley, Bengaluru
Kartik A Anagawadi	Industry 4.0	Gustovalley, Bengaluru
Kavyashree V Dandannavar	Industry 4.0	Gustovalley, Bengaluru
Keertika Savanur	Industry 4.0	Gustovalley, Bengaluru
KIRAN M MATHAD	Industry 4.0	Gustovalley, Bengaluru
Kiran Raikar	Industry 4.0	Gustovalley, Bengaluru
Kirankumar S Biradar	Industry 4.0	Gustovalley, Bengaluru
Kritika K Lokare	Industry 4.0	Gustovalley, Bengaluru
Lavanya Ellur	Industry 4.0	Gustovalley, Bengaluru
Laxman B Magadum	Industry 4.0	Gustovalley, Bengaluru
Laxmi I Koshti	Industry 4.0	Gustovalley, Bengaluru
Lingesh S Isari	Industry 4.0	Gustovalley, Bengaluru
M Arun	Industry 4.0	Gustovalley, Bengaluru
Mahamadfaiz M Patel	Data science	COJAG Smartech
Mahantesh Kalligudd	Industry 4.0	Gustovalley, Bengaluru
Mahesh Ballolli	Industry 4.0	Gustovalley, Bengaluru

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Ranjita Nayakar	Industry 4.0	Gustovalley, Bengaluru
Rashmi Badiger	Industry 4.0	Gustovalley, Bengaluru
Rohit Naikawadi	Industry 4.0	Gustovalley, Bengaluru
Sagar S Devaramani	Industry 4.0	Gustovalley, Bengaluru
Sahana B Bhavi	Embedded System	Emertxe information Tech,No. 83, 1st Floor, Farah Towers,M.G Road, Bangalore Karnataka –560001
Sahana Komar	CADDESK	Flat No 102, Krishna Grand, beside Khazana, Bengaluru
Sahana Komar	phyton	Parshi training and technical services pvt. Ltd, Bengaluru
Saherabanu Mehaboobali Nadaf	Industry 4.0	Gustovalley, Bengaluru
Sahil Benal	Industry 4.0	Gustovalley, Bengaluru
Sangamesh	Industry 4.0	Gustovalley, Bengaluru
Sangamesh N Vanahalli	Industry 4.0	Gustovalley, Bengaluru
Sangeeta Kopparad	Industry 4.0	Gustovalley, Bengaluru
Sanket S Wali	Active Noise Cancellation(ANC)	SiaNom Technologies, Bengaluru
Saraswati H Bandivaddar	Industry 4.0	Gustovalley, Bengaluru
Savitri Sajjan	Industry 4.0	Gustovalley, Bengaluru
Shashikala Biradar	Industry 4.0	Gustovalley, Bengaluru
Sheetal Sanjeevkumar Manvi	BSNL	RTTC, Mysore
Shivani keshannavar	Industry 4.0	Gustovalley, Bengaluru
Shivapriya M Paragi	Web development	Internship Studio
Shivapriya Paragi	Designing an e-commerce portal	Internship Studio
Shivayogi M Laddimath	Industry 4.0	Gustovalley, Bengaluru
Shridevi Patil	Industry 4.0	Gustovalley, Bengaluru
Shridhar Kumbar	Data science	COJAG Smartech
Shubham Pise	Data science	COJAG Smartech
Siddu Julapi	Industry 4.0	Gustovalley, Bengaluru
Soumya Bandigani	C - Programming and it's Applications	Internshipwala Careers, bangalore
soundaryabagade43@gmail.com	Industry 4.0	Gustovalley, Bengaluru
Spoorti H Tanksali	Data science	COJAG Smartech
Srinidhi Naik	Industry 4.0	Gustovalley, Bengaluru
Srinivas S Hungund	Data science	COJAG Smartech
Srushti Jogur	Industry 4.0	Gustovalley, Bengaluru
Sudheshna Milin Kulkarni	Internship on Iot	Vi Solutions, Bengaluru
Swati Vitthal Patroti	Industry 4.0	Gustovalley, Bengaluru
Udaykumar Doni	Industry 4.0	Gustovalley, Bengaluru
Uma	Industry 4.0	Gustovalley, Bengaluru

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JYOTHI KUMBAR	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
KAILASH	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
KAVYA NINGANAGOUDA PATIL	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
KIRAN BURAKAL	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
KIRAN SHANTAPPA NAIK	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bangalore
MADHU D	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
MEGHA BEELAGI	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
MOHAMMADJUNED INAMADAR	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
MUBEEN CHOUDHARI	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
NAGARAJ	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
NAGARAJ BHOVI	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
NAVEENKUMAR	Master Class on EV design using MATLAB	PANTECH Learning, Chennai
NAVEENKUMAR	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
NEELAGANGA GOUDAR	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
PAVANKUMAR JINNI	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
POOJA PATIL	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
PRIYANKA ROOGI	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
RAHUL PATIL	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
RAMESH V HUNAKUNTI	Electric Vehicle, Converter Design & Grid Power Quality Analysis	VI Solutions, Vasanthnagar, Bengaluru
REVANASIDDAPPA METRI	Master Class on EV design using MATLAB	PANTECH Learning, Chennai
RUTU RAVI SATYAPPGOL	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu

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		VEERESH K	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
		VIVEK	Industry 4.0	Gustovalley Technovations, Hosur, Tamil Nadu
ELECTRONICS & INSTRUMENTATION ENGINEERING	EI	AFTAB NADAF	Electric Vehicle, Converter Design and Grid Power Analysis	VI Solutions Pvt. Ltd., Bangalore (Online)
		AKSHATA BIRADAR	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		AKSHATA KONNUR	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		ARUNA R MUDAKAPPAGOL	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		ATHARVA J CHOPADE	Electric Vehicle, Battery Management, Converter Design and Smart Grid Power Analysis	VI Solutions Pvt. Ltd., Bangalore (Online)
		HARSHITA YAKKUNDI	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		LATA RAVI HUGAR	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		MOHAMMADTUFAIL A AKKALKOT	Electric Vehicle, Battery Management, Converter Design and Power Quality Analysis	VI Solutions Pvt. Ltd., Bangalore (Online)
		NIKITA SADASHIVAPPA ANGADI	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		PAVAN Y VYASAMUDRI	Electric Vehicle, Battery Management, Converter Design and Power Quality Analysis	VI Solutions Pvt. Ltd., Bangalore (Online)
		PRAMOD GURURAJ DESHPANDE	Electric Vehicle, Battery Management, Converter Design and Power Quality Analysis	VI Solutions Pvt. Ltd., Bangalore (Online)
		PRIYANKA P BADARADINNI	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		SATISH GODI	Electric Vehicle, Battery Management, Converter Design and Power Quality Analysis	VI Solutions Pvt. Ltd., Bangalore (Online)
		SAVITA PATRAD	Business Communication Skills	Internshala Trainings (Online)
		SHREYA SHRIKANT KARKUN	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		SHWETA S MALPANI	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)
		SRUSHTI TOTAD	Industrial IOT, Machine and Deep Learning	VI Solutions Pvt. Ltd., Bangalore (Online)

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		ROHINI P NEELAR	CNC Operation and Programming	(NASD)Ambewadi, Baarchi road,near Ganapati temple, Dandeli-581325
		SANJEEV R JOSHI	Punctuations Solutions Private Limited	Dattani, Prism 1IT Park, Vasai West.
		SHANE LEON	Vasavadatta Cement Kesoram Group Industrial Area	Sedam-585222 Tq-Sedam Dist-Kalburgi State-Karnataka
		SHARON EVANGELINE	Vasavadatta Cement Kesoram Group Industrial Area	Sedam-585222 Tq-Sedam Dist-Kalburgi State-Karnataka
		SOURABH R RODAGI	Modelling and Simulation of MASPL Plant for Productivity Improvement	251(P), 252TO264, 265(P), Narasapur Industrial Area,Bengalore-563133 Karnataka
		SRIDEVI S DEVARU	TATA Hitachi Construction Machinery Company Pvt Ltd.	Garage Road, Mummigatti, Dharawad-580011
		SRINIVAS B INAMATI	Bhagavathi CNC Technologies, Bengaluru	Peenya, Bengaluru-560058
		TARA SANJAY DESAI	Nandi Sahakari Sakkare Karkhane Niyamit	Krishnanagar, Vijayapur-587113 Tq&Dist-Vijayapur
		VIKRAM P NAIK	CNC Operation and Programming	(NASD)Ambewadi, Baarchi road,near Ganapati temple, Dandeli-581325
		SALEEMALI	HATTI GOLD MINES COMPANY LIMITED	Hatti-584115 Tq-Lingasugur Dist-Raichur State-Karnataka
		VEERESH SWAMY	CNC Operation and Programming	(NASD)Ambewadi, Baarchi road,near Ganapati temple, Dandeli-581325
INFORMATION SCIENCE & ENGINEERING	IS	AISHWARYA K C	Mobile Application Development	Insystel Technology Solutions, Pune
		AISHWARYA SUBHASH GHANIGER	Mobile Application Development	Insystel Technology Solutions, Pune
		AJAYAKUMAR GONI	Cyber Security	SmartKnower Bangalore
		AKASH ADAGOND	Agile SDLC, Customer Experience,SCRUM-JIRA, Android App dev and Enterprise software Revenue modelling	Insystel Technology Solutions, Pune
		AKSHATA BASAVARAJ KALLOLLI	Angular JS and Python	Mindvision Technologies, Bagalkot
		AKSHATA R PATIL	Mobile Application Development	Insystel Technology Solutions, Pune
		AMOGH GUDI	Object Detection using Machine Learning	Sianom Technology Bangalore

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RASHMI KULKARNI	Mobile Application Development	Insystel Technology Solutions, Pune
RASHMI HANAMAPPA HUDDAR	Angular JS and Python	Mindvision Technologies, Bagalkot
RITU RAVI VERNEKAR	Angular JS and Python	Mindvision Technologies, Bagalkot
RIYA REVANSIDDAPPA SHIVSIMPI	Agile SDLC, Customer Experience,SCRUM-JIRA, Android App dev and Enterprise software Revenue modelling	Insystel Technology Solutions, Pune
SAGAR	ASP.Net	SmarTec IT Solutions, Hubli
SAHANA J KUNTOJI	ASP.Net	SmarTec IT Solutions, Hubli
SAMANTA MANOJKUMAR PATIL	Mobile Application Development	Insystel Technology Solutions, Pune
SANJANA KALMESH KHANAPUR	Angular JS and Python	Mindvision Technologies, Bagalkot
SANJANA PRABHU HOSAKERI	Angular JS and Python	Mindvision Technologies, Bagalkot
SHIVALEELA S BASARADDI	ASP.Net	SmarTec IT Solutions, Hubli
SHIVANI SANSUDDI	Mobile Application Development	Insystel Technology Solutions, Pune
SHRADDHA KALASAD	ASP.Net	SmarTec IT Solutions, Hubli
SHREYA C MAJJAGI	ASP.Net	SmarTec IT Solutions, Hubli
SHRUSTI BALI	Mobile Application Development	Insystel Technology Solutions, Pune
SHRUTI HOSUR	ASP.Net	SmarTec IT Solutions, Hubli
SOUMYA R SHIVASHIMPI	ASP.Net	SmarTec IT Solutions, Hubli
SPOORTI BURJI	Agile SDLC, Customer Experience,SCRUM-JIRA, Android App dev and Enterprise software Revenue modelling	Insystel Technology Solutions, Pune
SRINIVAS JOSHI	Agile SDLC, Customer Experience,SCRUM-JIRA, Android App dev and Enterprise software Revenue modelling	Insystel Technology Solutions, Pune
SRUSHTI SHIRUR	ASP.Net	SmarTec IT Solutions, Hubli
SUJATHA	Angular JS and Python	Mindvision Technologies, Bagalkot
SUMAN CHIDANAND PATTAR	Angular JS and Python	Mindvision Technologies, Bagalkot
SUSHANT NIMBARGI	ASP.Net	SmarTec IT Solutions, Hubli
SUSHMA ANGADI	Angular JS and Python	Mindvision Technologies, Bagalkot

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MECHANICAL ENGINEERING	ME	ABHISHEK MARIHAL	CAD Vision RND Vijayanagar Bangalore	Bangalore
		ABHISHEK K	Intershala	Online
		ABHISHEK M B	Intershala	Online
		ABHISHEK V TELI	KBJNL Alamatti	Alamatti
		ABHISHEKH TADALGI	VTU, Belagavi Dandeli	Dandeli
		AJAYKUMAR	Pentech e-learning chennai	Chennai
		AKSHAY LAD	Pentech e-learning chennai	Chennai
		AKSHAY UPPIN	VTU, Belagavi Dandeli	Dandeli
		AMIT UMESH RATHOD	Pentech e-learning chennai	Chennai
		AMOGH N DESHPANDE	Elite Techno Group Jaipur, Rajasthan	Jaipur
		ANIL B ANAGAWADI	Ashok Iron Works Beagavi	Belagavi
		BALRAJ	Pentech e-learning chennai	Chennai
		BASANAGOUDA	VTU, Belagavi Dandeli	Dandeli
		BASAVAPRABHU S BHOVI	Gustovalley Technovations Hosur, TN	Hosur
		BASAVARAJ MALLAPPA RABAKAVI	Ashok Iron Works Beagavi	Belagavi
		BASAVARAJ VITTAL HALLUR	Pentech e-learning chennai	Chennai
		DHANANJAY KATHAVATE	Pentech e-learning chennai	Chennai
		DIVYA	VTU, Belagavi Dandeli	Dandeli
		DUSHYANTHA D S	Pentech e-learning chennai	Chennai
		KIRAN	VTU, Belagavi Dandeli	Dandeli
		KIRAN NAYAK	Pentech e-learning chennai	Chennai
		LACHAPPA GOWDA BASANA GOWDA HALEMANI	CAD Vision RND Vijayanagar Bangalore	Bangalore
		LINGESH KUMAR SAJJAN	Pentech e-learning chennai	Chennai
		MAHESH DHANAKASHIRUR	Pentech e-learning chennai	Chennai
		MALLIKARJUN SOLASI	Pentech e-learning chennai	Chennai
		MALLIKARJUNA S	Elite Techno Group Jaipur, Rajasthan	Jaipur
		MANJUNATHA	Pentech e-learning chennai	Chennai
		MANOHAR KUDARI	Pentech e-learning chennai	Chennai
		MANOJ KURANI	Pentech e-learning chennai	Chennai
		MITHUNA VEERESHA SHEDLIGERI	VTU, Belagavi Dandeli	Dandeli
		MRUTYUNJAY S BALLURGI	CAD Vision RND Vijayanagar Bangalore	Bangalore
		MUJAHID LIYAKAT BAGWAN	CAD Vision RND Vijayanagar Bangalore	Bangalore
		NAVEENKUMAR HIREMATH	South Western Railway Hubballi	Hubballi
		PANDURADDI H BALARADDI	VTU, Belagavi Dandeli	Dandeli
		PARIKSHIT GHASTI	Elite Techno Group Jaipur, Rajasthan	Jaipur
		PAVAN HEMU RATHOD	Jamkhandi Sugars, Nandkhedi	Nandkhedi
		POOJA KANAVI	VTU, Belagavi Dandeli	Dandeli
		PRADEEP BAGALE	CAD Vision RND Vijayanagar Bangalore	Bangalore

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SHRIDHAR SHRIKANT KULKARNI	CAD Vision RND Vijayanagar Bangalore	Bangalore
SHRIHARI ONKAR	Pentech e-learning chennai	Chennai
SHRUTI S HONNANNAVAR	CAD Vision RND Vijayanagar Bangalore	Bangalore
SIDDANNA KIRANALLI	Jamkhandi Sugars, Nandkhedi	Nandkhedi
SUNIL H KONGANUR	Pentech e-learning chennai	Chennai
SUNILKUMAR	CAD Vision RND Vijayanagar Bangalore	Bangalore
SUPREET BIRADAR	Nandi Sugars, Krishnanagar	Kishnanagar
SWAPNIL JATRATE	Ghodawath Foods International Pvt. Ltd	Sangali
TOHID HANAGANDI	Pentech e-learning chennai	Chennai
UDAYAKUMAR JEWOOR	CAD Vision RND Vijayanagar Bangalore	Chennai
USHASRI K	Pentech e-learning chennai	Chennai
VAIBHAV SHYALI	VTU, Belagavi Dandeli	Chennai
VEERESH MASKI	Pentech e-learning chennai	Chennai
VIGNESH	CAD Vision RND Vijayanagar Bangalore	Bangalore
VIJAY JADHAV	Pentech e-learning chennai	Chennai
VIJAY P BADIGER	CAD Vision RND Vijayanagar Bangalore	Bangalore
VIJAY P KARALE	Ashok Iron Works, Belagavi	Belagavi
VIKRAM H	Pentech e-learning chennai	Chennai
VIKRANT TOLAGATTI	Nandi Sugars, Krishnanagar	Krishnanagar
VINAYAKA POLICEPATIL	Royal Tech Valve, Hubballi	Hubballi
VINODKUMAR C VENKATAPUR	Narani Sugars, Mudhol	Mudhol
VISHVESHWAR SANGAMESH SANAKAL	Balaji Sugars Muddebihal	Meddebihal
ANUSHA C DUGGI	CAD Vision RND Vijayanagar Bangalore	Bangalore
ABHISHEK JAGADISH KUGALI	Gusto Valley Technovation Hosur, TN	Hosur
AMOGH I PATTANSHETTI	CAD Vision RND Vijayanagar Bangalore	Bangalore
BASU PATTED	Pentech e-learning chennai	Chennai
DHEERAJ BASUDE	Gusto Valley Technovation Hosur, TN	Hosur
DILEEPKUMAR K BHOVI	CAD Vision RND Vijayanagar Bangalore	Bangalore
GIRISH Y DADMI	VTU, Belagavi Dandeli	Dandeli
GURUSWAMI	VTU, Belagavi Dandeli	Dandeli
HARVI NARENDRA	CAD Vision RND Vijayanagar Bangalore	Bangalore
JAGADEESH TALAWAR	VTU, Belagavi Dandeli	Dandeli

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		SUSMITA KULAGOD	Study of Sugar Industry Processing and Wastewater Treatment	EID, Parry Sugars, Ramdurg
STRUCTURAL ENGINEERING	CSE	AKASH CHAVAN	Modeling and Analysis of G+2 residential Building	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		APOORVA N TORVI	Modeling and Analysis of G+2 residential Building Using Revit and Etabs	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		ARSHIYANAAZ YENDIGERI	Modeling and Analysis of G+2 residential Building Using Revit and Etabs	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		FARHANAZ KERUR	Modeling and Analysis of G+2 residential Building Using Revit and Etabs	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		GURURAJ HOLEYAPPANAVAR	Modeling and Analysis of G+2 residential Building	Angel Technologies,Bengaluru
		KAMALA S PATIL	Modeling and Analysis of G+2 residential Building	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		MEGHA M		
		MOHAMMED SUHAIL K MUJAWAR	Construction of Mini Vidanasoudha at Badami	M Earanna, Class-1 Contractor, FST Raichur Road, Manvi
		NINGAPPA MALLAKAJAPPA KOTAGI	Analysis and Design of Doddanekundi Metro Station	BMRCL Bengaluru
		RAHUL BASAVARAJ BEVINAGIDAD	Modeling and Analysis of G+2 residential Building	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		SAHEBGOUDA BIRADAR	Analysis of College Building Using Staad Pro	Anagha Engineering Consultants
		SANGAMESH	Analysis of College Building Using Staad Pro	Anagha Engineering Consultants
		SHARANABASAVARAJ RADDER	Modeling and Analysis of G+2 residential Building Using Revit and Etabs	Medini Technology, Opp. Maruti Mandir, Vijaynagar, Bengaluru
		VINAYAK S LALASANGI	Analysis of College Building Using Staad Pro	Anagha Engineering Consultants
MACHINE DESIGN	MMD	MEGHA C SOPPIHIREMATH	Eid Pyari Sugar Industry	Bagalkot
		PRATAP HIREMANI	CADVISION RND, Bangalore	Bangalore
		RENUKA RAMESH TALAWAR	Bagalkot Cement & Industries Limited, Bagalkot	Bagalkot
		SAIDABANU	Eid Pyari Sugar Industry	Bagalkot
		SATISH KULAKARNI	CADVISION RND, Bangalore	Bangalore
		SHREEKANT M TUMBARAMATTI	CADVISION RND, Bangalore	Bangalore

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KIRAN M RATHOD	Organization Study at Fincare Small Finance Bank	Bagalkot
LADLEMASHAK S KUNTOJI	Organization Study at Prepare Edutech Bagalkot	Bagalkot
NADEEM MAINUDDIN ITAGI	Organization Study at MSQUARE FACADE	Bagalkot
NAGARAJ PADASALI	Organization Study at Fincare Small Finance Bank	Bagalkot
PALLAVI MUPPAYYANAMATH	Organization Study at Fincare Small Finance Bank	Bagalkot
POOJA GULAPPAGOL	Organization Study at J.K. Cement Ltd. (Unit: J K Cement Works)	Mudhol
PRADEEP DODAMANI	Organization Study at SHAREKHAN Ltd.	Bagalkot
PRAJWAL SAMBHAPUR	Organization Study at Dolphin Stone Crusher and M sand plant	Bagalkot
PRAMODAGOUDA PATIL	Organization Study at Fincare Small Finance Bank	Bagalkot
RADHIKA VIJAYKUMAR DAYAMA	Organization Study at MUNDRA R.N.& CO.,	Bagalkot
RASHMI S SHIRUR	Organization Study at Kittur Rani Channamma Urban Credit Souhard Sahakari Ltd.Muddebihal	Muddebihal
RATHOD AJAY NAMDEV	Organization Study at Fincare Small Finance Bank	Bagalkot
SHILPA SANGAPPA BADIGER	Organization Study at Prepare Edutech	Bagalkot
SHIVALEELA PARAPPA DADDI	Organization Study at The Karnataka Co-operative Bank limited, Muddebihal	Muddebihal
SHOBHA C SHIVAPOOJIMATH	Not Submitted the report	
SHRIRAKSHA KULKARNI	Organization Study at Fincare Small Finance Bank	Bagalkot
SHRISANTOSHAMATA BHADRANNAVAR	Organization Study at Mindvision technologies	Bagalkot
SHRUTI RAMESH HUNASHYAL	Organization Study at Help-in consulting services	Bagalkot
SHWETA PUJARI	Organization Study at Shreenaath Metal's Pune	Pune
SIDDANNA SHIVAPPA TUMBARAMATTI	Organization Study at Mahindra and Mahindra Financial Service Ltd.	Bijapur
SPOORTI DEVAGIRIKAR	Organization Study at Bagalkot Cement and Industries Ltd	Bagalkot

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Student Project				
Programme name	**Program Code**	**Name of students undertaking field projects /internships/student projects**		
INDUSTRIAL & PRODUCTION ENGINEERING	IP	MALLIKARJUN L SAVADI	An IoT Based Cargo Monitoring System	BEC, BAGALKOTE
		SHRIKANT SAYABANNA TENNEHALLI	An IoT Based Cargo Monitoring System	
BIOTECHNOLOGY	BT	ASHWINI N	Herbal Formulations for removing the pesticides on fruits and vegetables	BEC, Bagalkote
		CHANDRAKANT KULKARNI	Biodegradable plastic with antimicrobial activity	
		DANESHWARI DIGAMBARIMATH	Synthesis and optimization of silver nano particles from Aspergillus Spp	
		KIRAN V MALLANNAVAR	Biodegradable plastic with antimicrobial activity	
		MEGHA R BEELAGI	Herbal Formulations for removing the pesticides on fruits and vegetables	
		NEHA HUNDEKAR	Protection of Maize crop from pesticides	
		NISHA BEGUM	Hydrophonics	
		PREETI PURANIKMATH	Pongamia Pinnata as a promising bio-fertilizer	
		PRIYANKA BASAVARAJ GULALAKAI	Hydrophonics	
		SANKALP VEERUPAKSHAGOUDA PATIL	Biodegradable plastic with antimicrobial activity	
		SHREYA BASUTKAR	Pongamia Pinnata as a promising bio-fertilizer	
		SINCHAN YAMANAPPA BAJANTRI	Synthesis and optimization of silver nano particles from Aspergillus Spp	
		SOUMYA NYAMAGOUDAR	Protection of Maize crop from pesticides	
ELECTRONICS & COMMUNICATION ENGINEERING	EC	Shreevasta.P.Kulkarni	Sensor Controlled Automatic Gate	BEC, Bagalkote
		Maltesh S.Ayatti	Sensor Controlled Automatic Gate	
		Suhas.S.Majjagi	Sensor Controlled Automatic Gate	
		Sangamesh.G.N	Sensor Controlled Automatic Gate	
		Rahul.U.Taranal	Obstacle Detection using 360 Degree Military Lidar Scanner	
		Prabhukumar	Obstacle Detection using 360 Degree Military Lidar Scanner	
		Channabasu Anteen	Obstacle Detection using 360 Degree Military Lidar Scanner	
		Praveen Dali	Obstacle Detection using 360 Degree Military Lidar Scanner	

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Sahana.P.B	GPS based Voice alert system for blind people
Sneha Pattar	Smart Bus Monitoring System Using IoT
Suma.K	Smart Bus Monitoring System Using IoT
Mangala.C	Smart Bus Monitoring System Using IoT
Soumya.K.U	Smart Bus Monitoring System Using IoT
Srusti.S.H	Smart Parking System Using Web of Things
Sneha.S.Hullyal	Smart Parking System Using Web of Things
Aishwarya.S.G	Smart Parking System Using Web of Things
Swati.Jagadale	Smart Parking System Using Web of Things
Anjali.D.K	Automatic Railway Gate Controller
Keerti.G.Patil	Automatic Railway Gate Controller
Pruthvi.S.N	Automatic Railway Gate Controller
Chaitra.M	Advanced Automatic e-CAR
Aishwarya.B.B	Advanced Automatic e-CAR
Aishwarya.S.N	Advanced Automatic e-CAR
Pranav Hemadri	Density Traffic Signal System
Rohit Aribenchi	Density Traffic Signal System
Rohit Khot	Density Traffic Signal System
Puneet Ulli	Density Traffic Signal System
Megharaj.M.B	Car accident prevention on Highway
Mdyunus Kazi	Car accident prevention on Highway
Naveen M.A	Car accident prevention on Highway
Tushar.P.T	Car accident prevention on Highway
Prajakta.A	Hand Gesture controlled wheel Chair
Shashank.S.B	Hand Gesture controlled wheel Chair
Karthik N.B	Hand Gesture controlled wheel Chair
Mahalaxmi S.M	Robot for Human Detection
Soumya.Rajaput	Robot for Human Detection
Varshita Kumbar	Robot for Human Detection
Srushti Banakar	Robot for Human Detection
Apoorva.R.Akki	Sensor Based Gas Leakage Detection System
Iranna.M	Sensor Based Gas Leakage Detection System

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Kenchesh Chabbi	Design and Implement Energy Monitoring System using IoT
Pooja.R.B	Smart Water Tap
Naveen Pyati	Smart Water Tap
Shyamasundar Singh	Smart Water Tap
Gogikar Pradeep	Smart Water Tap
Aniruddh.B.Joshi	Driver Anti Sleep Device Project
Abhishek.K.Patil	Driver Anti Sleep Device Project
Mahesh B.Madli	Driver Anti Sleep Device Project
Mahaning Hunnur	Driver Anti Sleep Device Project
Aishwarya	Smart pesticide spraying ROBOT
Anuja.S.Iraj	Smart pesticide spraying ROBOT
Suvarna.Y.Dalawai	Smart pesticide spraying ROBOT
Veena.M.Hanagi	Smart pesticide spraying ROBOT
Akshata.Shahapur	Smart Crop Protection from Animals Pic
Akshay Reneke	Smart Crop Protection from Animals Pic
Bhagyashree Sada	Smart Crop Protection from Animals Pic
Kalmesh.B.B	Energy generation and Smart Street Light Controlling
Shrinivas.Kadiwal	Energy generation and Smart Street Light Controlling
Amit Sawant	Energy generation and Smart Street Light Controlling
Veeresh Boragi	Energy generation and Smart Street Light Controlling
Priyanka Gombi	Third Eye for Blind people
Shridevi Gongale	Third Eye for Blind people
Muskan Bankur	Third Eye for Blind people
Sanchit Patil	Third Eye for Blind people
Gururaj Tapashetti	Sustainable and No Contact Attendance System
Chetan Wadaganvi	Sustainable and No Contact Attendance System
Anwar Mulla	Sustainable and No Contact Attendance System
Vijaymahantesh N	Sustainable and No Contact Attendance System
Shoaib Killedar	Non Invasive Glucose Meter
Rashmi Hiremath	Non Invasive Glucose Meter
Raqib Makandar	Non Invasive Glucose Meter

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		DEEPAK AMBALI	Impact of Social Media on Academic Performance among Engineering Students	
		OMKAR HARIRAJ KALAL	Attitude and Perception Engineering Students about online Education Post COVID-19	
		PRIYANKA N GOUDAR	Impact of Social Media on Academic Performance among Engineering Students	
		SANGANABASAPPA N TAKKALAKI	Automatic Door Opening Systems Using IR Sensor	
		SHREYA V SHANAWAD	Impact of Social Media on Academic Performance among Engineering Students	
		SHRISHAIL R KUMBAR	An IoT Based Home Automation System	
		SURESH S GUDAGUDI	Analysis of Casting Defects Using Expert System in Foundry	
		SUSHMITA NANDAPPA TALIKOTI	Analysis of Casting Defects Using Expert System in Foundry	
		JYOTI MAVINAKATTI	Attitude and Perception Engineering Students about online Education Post COVID-19	
INFORMATION SCIENCE & ENGINEERING	IS	Akshay M. Joshi	Event Management System of the BEC	BEC, Bagalkote
		Amith A. Tandur		
		Basayya Hangaragi		
		Prajwal Basavaraj Hiremath	Department Information System	
		Satish Kali		
		Vinayak R. Gotagunki		
		Bharat Garade	Real Time Facial Expression based Smart Music Player	
		Chetan Halkurki		
		Om U. Tikare		
		Vinodkumar Poleshi	Faculty Information System	
		Akshaya S. Halyal		
		Shridhar S. Naik		
		Ashish Chandrashekhar Gunaki	The Department Management System	
		Kaushik Mandali		
		Kishan Vadavadagi		
		Mallikarjun R. Jainapur	AI based chatbot to answer FAQs	
		Prajwal Basavaraj Majjigi		
		Udayakumar M. Hiremath		
		Akash V. Malenni	Cricket Ticket Booking System	
		Mahammadnajimusakib		

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		Aachal S. Hosmani	E-Commerce Website	
		Gayatri		
		Spoorti Urabhinavar		
		Ashwini Tengale	ISE Department Research Data Management System	
		Daneshwari J. Chiniwal		
		Hema B. Patil		
		Pooja B. Ragi	Hostel Mess Management	
		Priyanka V. Sooranagi		
		Vidya A. Murteli		
		Chaitra Kolur	Coaching Institution Management System	
		Aishwarya		
		Muskan Hadimani		
		Anand Dundappanavar	Youtube Transcript Summarizers	
		Madhav G. Desai		
		Pranav A. Huilgol		
		Harshavardhan	Smart Medicine Reminder for elderly people	
		Nitish		
		Sujan N. K.		
		Swaraj Jinnad	Student Result Management System	
		Samarth Chattaraki		
		Sameer H. Deshapande		
		Nikita N. Shetti	Fees Management System	
		Anvita B. Sirdesai		
		Yashodha Y. Yalagannavar		
		M. Vishal	Python OpenCV object detection	
		Shreyas C. Shetty		
		Varun Y. Koppad		
		Ashwini Andangouda Patil	Agricultural Management System	
		Anusha S. Jali		
		Megha Hosur		
		Afak Makandar	Online Notice Board System	
		Prasad Kadapatti		
		Rajshekhar Basappa Patil		
		K. Nandini	Voice Based email for visually impaired	
		Vaishnavi R. P.		
MECHANICAL ENGINEERING	ME	UDAYA NASHIPUDI	Automated plant irrigation system (APIS) for rice plantation	BEC, Bagalkot
		KESHAV V DESHPANDE	Sieving machine using crank and slotted lever mechanism	
		PRAKASH GURUBHETTI	Design and Fabrication of Mechanical Crop Cutter	
		YUNUS HUSENBASHA WALIKAR	Simulation on Casting	

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BHIMSHI CHANABASAPPA HUDDAR	Pedal operated cell phone charger
CHANDSAB BASHIRAHMED TAHASILDAR	Fabrication and design of multistage sand seperator and filter
CHETAN P JAWOOR	Fabrication and design of multistage sand seperator and filter
CHIRAG B PATIL	Design of regenerative braking system
DANESH MASALI	Conveyor belt based colour cube sorter using arduino
DAVALASAB C KURTAKOTI	Design and Fabrication of Mechanical Crop Cutter
GURUPRASAD	Design and Fabrication of Brimmed diffuser in wind turbine
GURURAJ N INGALAGI	Design and Fabrication of Brimmed diffuser in wind turbine
ISHWARAPPA MEGERI	Sieving machine using crank and slotted lever mechanism
JAYADEV C TIPPANNAVAR	Trajectory analysis on robot arm
JEEVAN	Design and development of an affordable and portable e-bicycle kit
KARTIK VASTRAD	Algae Removal machine
KHANDERAO BABURAO BOROLE	Solar air conditioner
MAHANTESH MAHADEV AKALE	Design and Fabrication of Mechanical Crop Cutter
MAHESHWAR S K	Trajectory analysis on robot arm
MALLIKARJUN KANKANAWADI	Sieving machine using crank and slotted lever mechanism
MALLIKARJUN P BASARAKOD	Design of regenerative braking system
MANJUNATH M SHEERI	Anti sleep alarm for driver
MANJUNATH MAJJAGI	Design and Simulation of power generating speed breakers
MANJUNATH MULLAL	Design and Modelling of vacuum brake system using CATIA
MANJUNATH SHIVANANDA HUGAR	Cigarate Smoke Detection system
MANJUNATH MALLAPPA KUMBAR	Algae Removal machine
NAGARAJ UDANNAVAR	Fabrication and design of multistage sand seperator and filter
NITISH SANJEEV TONAPI	Algae Removal machine
OMKAR	Pedal operated cell phone charger
PARVEEJ KOKATANOOR	Cigarate Smoke Detection system
PRAJWAL KOLADUR	Sieving machine using crank and slotted lever mechanism
PRASHANT JADAR	Air purifier and Humidifier

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SHIVAYOGAPPA M KAGALGOMB	Design and implementation of SPV powered novel type of water filter
SHRAVAN S PILLE	Design and Modelling of vacuum brake system using CATIA
SHREEDHAR PARAMAPPA YARANAL	Manually operated road and floor cleaning machine
SHRIDHAR SAMBHAJI CHAVAN	Simulation on Forging
SIDDAPPA R YAMAGAR	Cigarate Smoke Detection system
SIDDHARTH MANGOND	Analysis of the effect of preheating system to improve efficiency in LPG fuelled small industrial burner
SOMANATH A KOLURAGI	Manually operated road and floor cleaning machine
SOWMYA B KANOJI	Automated plant irrigation system (APIS) for rice plantation
SRIVATSA PRAMOD KULKARNI	Trajectory analysis on robot arm
SUDESH C BEKINALKAR	Bullet proof glass
SUNEEL S HEGGOND	Underground hydraulic car parking system
SURYA PRAKASH	Bullet proof glass
UDAYKUMAR V KATTIMANI	Design and development of portable square drilling machine.
UMESH KARENNAVAR	Water Managing Mechanism
UMESH S MAREKAR	Design and Modelling of vacuum brake system using CATIA
VEERENDRA RAJENDRAYYA SWAMI	Airbag System for 2 - Wheeler vehicle system
VENKATESH MUNIYAPPA BHANDARI	Design and Simulation of power generating speed breakers
VIKRAM BABANAGAR	Automatic fingerprint door locking system
VINAY KAMANI	Anti sleep alarm for driver
VIRESH SHIVAPPA RANJUNGI	Simulation on Casting
VISHAL R MUDNOOR	Airbag System for 2 - Wheeler vehicle system
WASIM PATHAN	Bullet proof glass
ADITYA P SAMBRANI	Analysis of Braking system for EVs
AKASH B MARSANALLI	Design and Simulation of power generating speed breakers
BASAPPA MYAGERI	Automatic fingerprint door locking system
HEENAKOUSAR I ATHANUR	Analysis of Braking system for EVs
HUSENBHASHA	Fourway hacksaw

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		Anand Lamani	WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM	
		Simiran .r Anehosur		
		Praveen C		
		Ramesh Udapadi.		
		Yogeshwar S K	EVERGY REGENERATION & CONSERVATION SYSTEMS IN EVs	
		Surendara B Godbole		
		Arabazali Choudhari		
		Prasad Tondle		
ELECTRICAL & ELECTRONICS ENGINEERING	EE	RASOOL AHMED	Development of Secure Cloud System for Data Acquisition	BEC, Bagalkot
		ABHISHEK RAJU HIPPARAGI	Development of Secure Cloud System for Data Acquisition	
		ABHISHEK S BALAGANUR	Automatic Timer Controlled SPV Lighting System for BEC Energy Park	
		ABHISHEK VIJAYAGOUDA PATIL	Design and Testing of Truncated Hexagonal Pyramid Collector Solar Water Heater	
		AJAY KUMAR ISHWARAPPA BAVALATTI	PROJECT WORK NOT COMPLETED	
		AKSHAY M DALAL	Testing of Solar Powered Micro Refrigerator	
		ALLAUDDINPARVEZ MUJAWAR	Modification of Conical Collector Water Heater	
		ANJALI A DANI	Implementing and Testing of Smart Battery	
		ASHWINI HOLAKAR	Implementing and Testing of Smart Battery	
		BALCHANDRA C CHANDRAGIRIVAR	Design and Testing of Truncated Hexagonal Pyramid Collector Solar Water Heater	
		BASANA GOUDA	Development and Testing of IOT Based Monitoring Interface for Solar Box Cooker	
		BHAGYASHREE VAGGAR	Design and Implementation of SPV Powered Novel Type of Water Pump	
		BHAGYASHREE NYAYAKAR	Solar Powered Spryer for Farm and Building Construction Application	
		BHAGYASHREE SAJJAN	Fabricating and Testing of Roof Top 400W Wind Aero-Generator in BEC Distribution Network	
		BHARATI R LEKKIHAL	Testing of Solar Dryer and Solar Still	
		BHASKAR K KULKARNI	IOT Based Health Monitoring System and Social Using Aurdino UNO	
		B T SEENU	PROJECT WORK NOT COMPLETED	

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SANGEETA SHARANAPPA RADDER	Testing and Performance Study of SPV Powered 0.25HP AC Water Pumping System
SANTOSH YADAWAD	Development and Testing of IOT Based Monitoring Interface for Solar Box Cooker
SANTOSHAKUMAR KHANAPUR	Testing and Performance Study of SPV Powered 0.25HP AC Water Pumping System
SHILPA SURESH PAMMAR	Implementing and Testing of Smart Battery
SHIVASHANKAR RAVINDRA UGAR	Development of Secure Cloud System for Data Acquisition
SHREYAS SRESTA PRAKASH	Testing of Solar Powered Micro Refrigerator
SNEHA BHIMAPPA HOTTI	Implementing and Testing of Smart Battery
SUNITA	Development of Secure Cloud System for Data Acquisition
TEJASWINI C DIVATAR	IOT Based Health Monitoring System and Social Using Aurdino UNO
TOUQEERAHMAD INAMDAR	Testing and Performance Study of SPV Powered 0.25HP AC Water Pumping System
VEENA S GIDAGANTI	Fabricating and Testing of Roof Top 400W Wind Aero-Generator in BEC Distribution Network
VIDYASHRI GOVINDAPPA RATHOD	Performance Analysis of Solar Powered E-Bicycle
VINAYAK B HOSAMANI	Design and Testing of Truncated Hexagonal Pyramid Collector Solar Water Heater
ARIHANT BHARAMU DONAGE	Gym Bicycle for Electricity Generation
BHARGAV SHEMBELLIKAR	Fabricating and Testing of Roof Top 400W Wind Aero-Generator in BEC Distribution Network
CHANDAN L K	Gym Bicycle for Electricity Generation
GAGAN N PAMMAR	Solar Powered Spryer for Farm and Building Construction Application
HANUMESH B	Fabricating and Testing of Roof Top 400W Wind Aero-Generator in BEC Distribution Network

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DEEPAK KALASANNAVAR	Patients Record Managing System For Hospital
DEEPIKA MATHAPATI	Tourist Guide System
DIXITA HADAGALI	Barbie With Brains : An Interactive ROBOT
DRAKSHAYINI HIREGOUDRA	Knock Pattern Detecting Door Lock System
GIRISH MAHADEV KARKI	Driver Drowsiness Detection System
GOURAVVA HUGAR	Knock Pattern Detecting Door Lock System
GURUNATH H RATHOD	Driver Drowsiness Detection System
JAYASHREE S BHIXAWARTHIMATH	A.I Based key board typing tutor
KAVYA SHIRUR	Bike Showroom Management System
KEERTHANA S P	Hostel Management Systems
KIRAN B PAIL	Faculty Database Management System
KISHAN SATISH DHAGE	Driver Drowsiness Detection System
ANNAPURNESHWARI LINGARAJ KURI	Hostel Management Systems
LAXMI B KENCHAPPAGOL	Barbie With Brains : An Interactive ROBOT
LINGARAJ M MANOLI	Online Courier Service System
MAHALINGESH KOUJALAGI	Web Grocery Application
MAHIMA PANIGATTI	College Recommendation System
MALLIKARJUN KHICHADI	Crop Disease Recognition Using Machine Learning
MANIKANTA D	Web Grocery Application
NAMRATA GOPAL EKABOTE	Hostel Management Systems
NIKHIL NETAJI NALAVADE	Web Crawler
NISHA PREMASING NAIK	3D Bike Simulation
NIVEDITA S KALAMANGI	Rock Paper Scissors Game
PALLAVI CHAVHAN	BEC Attendance And Marks Management System
POOJA J KAMBAR	College Recommendation System
POOJA MALLIKARJUN KELUR	Pharmacy Management System
PREETI BENDIGERI	Students Information Management System
RAJASHREE TADASANAVAR	Bike Showroom Management System
RAJU ARJUN	Patients Record Managing System For Hospital
RAMJAN SANTI	Faculty Database Management System
REKHA S BASAPUR	Pharmacy Management System
REKHA WAGHAMODE	Online Quiz System

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		VISHAL RAJAPUT	Tourist Guide System	
		SRUSHTI GURUBASAPPA TOTAGER	Location Identification in Campus MAP	
		NEEMA GUDISAGAR	Location Identification in Campus MAP	
		NIKHITA K MIRAJAKAR	Location Identification in Campus MAP	
		ASHITOSH UDAY DESHNUR	Image Based Description And Recognition	
		CHETHANA SHIVAPUTHRAPPA KUMBARA	Image Based Description And Recognition	
		KAMALAKSHI M SONAR	AgriBuzz	
		RAHUL KHANAPURI	Image Based Description And Recognition	
		RAJENDRA B KARANDE		
		ROOPA	BEC Attendance And Marks Management System	
		SHRINIVAS KATTIMANI	Image Based Description And Recognition	
		SOHAIL YALAGAR	AgriBuzz	
		SOUJANYA MANOOR	AgriBuzz	
BIOTECHNOLOGY	BT	AMRUTH DEEPAK BHAT	Serum metabolomic investigation of glioma biology & pathogenic	IITB, Mumbai
		ANUSHA B KAWATAL	GCMS based phytochemical profiling invitro anti oxidants wound healing and flow cytometry based anticancer pathway studies of Allophylus cobbe	Hubballi
		CHAITANYA SANJAY KAGWADE	A Review on pharmaceutical validation and its implications	Bengalore
		KALPANA SOMAPPA LAMANI	Development of antimicrobial and Bio-derived nano-composite for packaging	Bagalkote
		KRUTI N NIMBARAGI	GCMS based phytochemical profiling invitro anti oxidants wound healing and flow cytometry based anticancer pathway studies of Allophylus cobbe	Hubballi
		NEHA ALLABHAKSHA BAGAWAN	Effluent treatment study in pharmaceutical industry (ZLD plant)	Bagalkote
		PAVANAKUMAR	A Review on pharmaceutical validation and its implications	Bengalore
		PAVITRA IRANNA KATAGERI	Spirulina enriched protein bar	Bagalkote
		PRATIKSHA P RUDRAKSHI	Colour optimization of jaggery	Kholapur

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		PREMKUMAR PATIL	Solar Multi Utility Agricultural Vehicle	
		RAGHAVENDRA NINGASANI	Automatic Vehicle Accident detection and Alerting System Using GSM & GPS	
		SHREE RAJESH RAMDURGAKAR	Automatic Braking Using EYE Blink Sensor	
		VENKATESH L BANDIWADDAR	Battery Monitering System and Charging station Located Using IOT	
COMPUTER SCIENCE & ENGINEERING	CS	LAVANYA MYAGERI	Image Splicing Forgery Detection Using Deep Learning	BEC, Bagalkote
		RAKSHIT P MANNUR	Detection and Prevention of Cyber Frauds in Banking Applications using Machine Learning Techniques	
		ANUSHA MORE	Medical suggestive system for senior citizen	
		SANTHOSHKUMARA VEERAYYA GUDI	IoT Based Automatic Street Light ON/OFF System Using Moving Object Detection	
		TRUPTI B PUJAR	Medical suggestive system for senior citizen	
		VINAY S PATTANASHETTI	Detection and Prevention of Cyber Frauds in Banking Applications using Machine Learning Techniques	
		MAHESH	Detection and Prevention of Cyber Frauds in Banking Applications using Machine Learning Techniques	
		ABHISHEK BATAKURKI	AI-Based Tourist Guide	
		ABHISHEK GUJJAR	Smart signal system based on traffic Analysis	
		ADISH KHEMALAPURE	Intelligent Garbage Collecting System	
		ADITI SINGRI	Copd Identifier	
		AKASH PRADEEP KORACHAGAON	Iot Based Smart Car Parking System	
		AKSHATA KUDARI	CO-SPACE (Android based project)	
		AMITKUMAR MALIPATIL	IoT Based Automatic Street Light ON/OFF System Using Moving Object Detection	
		ANAND M KUMBAR	Road Quality Assessment And Comfortable Path Suggestion	
		ANIRUDH	Iot Based Smart Car Parking System	
		APOORVA	Automated Temperature and Mask Scanning System	
		APPASAHEBGOUD PATIL	Smart signal system based on traffic Analysis	

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PURNIMA HANUMANT CHABBI	Digital Vehicle Instant Search
RAGINI P ANVEKAR	Charity System Using Block chain
RAHUL H PATIL	Road Quality Assessment And Comfortable Path Suggestion
RAKSHIT A CHOPADE	Emergency Vehicle Braking Support System
RAKSHIT G PAWAR	Intelligent Garbage Collecting System
RANJITA MADARI	Plant irrigation water sprinkler robot
RAVIKANT BHUSHANNAVAR	IoT Based Automatic Street Light ON/OFF System Using Moving Object Detection
ROOPA KUNIJADAR	Solar Energy Monitoring system (IOT)
SAMREEN IQBAL MUJAWAR	Tech Farming Using IoT
SANJEEV BHIMASEN KULKARNI	Plant irrigation water sprinkler robot
SHRAVAN VIJAYKUMAR MUNGARWADI	Emergency Vehicle Braking Support System
SHREYAS M GHANEKAR	AI and IoT Based Gate Control System
SHRINIDHI R RANGAPUR	Spur-The Nurse Assistance Bot
SOUMYA ANGADI	Spur-The Nurse Assistance Bot
SOUMYA B	Tech Farming Using IoT
SOUMYA Y BIJAPUR	Tech Farming Using IoT
SPURTHI	Spur-The Nurse Assistance Bot
SUNIDHI S PARVATIKAR	Spur-The Nurse Assistance Bot
TEJASHWINI NAGAPPA SAJJAN	Solar Energy Monitoring system (IOT)
TEJASHWINI TARASING CHAVAN	Image Splicing Forgery Detection Using Deep Learning
TULASABAI CHAVHAN	Solar Energy Monitoring system (IOT)
URMILA	AI and IoT Based Gate Control System
VARUN MELINAMANI	AI and IoT Based Gate Control System
VIDYA	AI and IoT Based Gate Control System
VINAY C PATIL	Emergency Vehicle Braking Support System
VINAYA UPPAR	Tech Farming Using IoT
VINAYAK PATIL	Emergency Vehicle Braking Support System
VISHVESH ARALIKATTI	Smart signal system based on traffic Analysis
VIVEK SHAMBULINGA HALAKATTI	AI-Based Tourist Guide
GHULAM HASSANAIN	e-Pass Management System
PARAS THAKUR	GroMart
YASH AMRUTH DARBAR	Road Quality Assessment And Comfortable Path Suggestion
RISHABH A KOTHARI	Intelligent Garbage Collecting System

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Ashish Chandrashekhar Gunaki Kaushik Mandali Kishan Vadavadagi	The Department Management System
Mallikarjun R. Jainapur Prajwal Basavaraj Majjigi Udayakumar M. Hiremath	AI based chatbot to answer FAQs
Akash V. Malenni Mahammadnajimusakib Amaan Ali Tegginamani	Cricket Ticket Booking System
Vinaya B. Patil Rashmi Angadi Rashmi P. Koti	PI-BOT
Darshan S. Yadal Venkatesh Vinayak Kulkarni Venkatesh Javalagi	Online Medicine Donation
Aishwarya B. Sangapur Kaveri Angadi Pallavi Shivasharan Hanjagi	Ordering Management System
Sneha Irappa Sidnal Saniha Hunur Tejashwini Chigadolli	Student Leave Management System
Sudha Hebbalatti Megha M. Chavhan Veena Neelanayak	Satellite World
Apoorva Chiniwar Akshata S. Bakale Poonam Ningangouda Patil	Publication Management System
Sushma Metagudda Vijaylaxmi L. Koraddi Shivani Bijapur	Student Academic Analysis System
Prachi Solankare Bhagyashree Patted Aishwarya R. Kannalli	Online Doctor Management System Appointment
Prathamesh Jadhav Rani D. D. Laxmi Shinde	Remote Control Door Locking System
Sneha Goudar Shreya Soratur K. Madhushri	Automation Of Time Table Preparation
Amruta Math Nayana Budni Shreya B. Jana	Car Rental System
Pooja B. Mavinkai	CNC 2D Plotter and Routing Machine

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ELECTRONICS & COMMUNICATION ENGINEERING	EC	ALSIFA DANGE	Routing protocols in WSN	BEC, Bagalkote
		SANCHIT SANJAY PATIL	Women safety night patrolling IoT Robot	
		PRAJWAL D KULKARNI	Railway ticket booking and validation with facial recognition and mask detection	
		NUTAN PUJAR	Railway ticket booking and validation with facial recognition and mask detection	
		VINAYAK Y HORATTI	Women safety night patrolling IoT Robot	
		CHIDAMBAR VENKATESH GUMASTE DESAI	Advanced Smart –E Vehicle	
		MEENAZ URF MANNAM BALIKAYI	Border Security Robot	
		NITIN TERADAL	Advanced Smart –E Vehicle	
		PRAGATHI P HIREMATH	Border Security Robot	
		S NAVEEN	Advanced Smart –E Vehicle	
		SUSHMITA	Women safety night patrolling IoT Robot	
		ABDULRAZAK PATEL	Mimicry detection	
		ADARSH RAVINDRA KUMBAR	Personal cloud storage using raspberry Pi	
		AISHWARYA TENGINAKAI	IoT based underground cable fault detection	
		AJAYKUMAR C MALLIMATH	GAIT Analysis	
		AKSHATA P KALIBAGI	Consonant-Vowel ratio modification in speech signal using Matlab	
		ANIRUDH BANNIKOPPA	Personal cloud storage using raspberry Pi	
		ANITARANI S BALANNAVAR	The Virtual Eye	
		ANJALI M KIRESUR	Consonant-Vowel ratio modification in speech signal using Matlab	
		ANJANA P KULKARNI	Assistant for dual-sensory impaired people	
		ANUP PUROHIT	Personal cloud storage using raspberry Pi	
		ANUPAMA KALAHAL	The Virtual Eye	
		ANVESH HIREMATH	Mimicry detection	
		ASHIKA PARASHURAM MALAGI	IoT based underground cable fault detection	
		ASHWINI BHAGAVATI	Health monitoring system of diabetic patients using python	
		ASHWINI BADIGER	Leaf disease detection using image processing	

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N SHIVANI	LoRaFarm: a LoRaWAN- based smart farming
NAGARAJ B HITTALAMANI	Hand gesture and voice controlled wheel chair
NANDINI TALLIKERI	Clustering in Wireless sensor network
NAVEEN SUBHASGOUDA PATIL	Hand gesture and voice controlled wheel chair
OMKAR G SANGOTE	Self -Monitored Oxy-Treat
PARVATHI HUBBALLI	Leaf disease detection using image processing
PAVAN M MALASHETTI	GAIT Analysis
PREETI K MUDIGOUDAR	IoT based underground cable fault detection
RABBANIHUSEN A	Robotic Lawn mower
RAGHAVENDRA GABBUR	Bridge Monitoring system using IoT
RAHUL MAHENDRAKAR	Smart Bike stand control system
RAKSHITA VEERESH TENGINAKAI	Crack detection in buildings using deep learning
RANJITA NAYAKAR	Authentication of IoT devices using Machine learning algorithms
RASHMI KRISHNAPPA BADIGER	Authentication of IoT devices using Machine learning algorithms
ROHIT RAMAESH NAIKAWADI	LoRaFarm: a LoRaWAN- based smart farming
SAGAR S DEVARAMANI	Robotic Lawn mower
SAHANA B BHAVI	Data management in IoT using machine learning
SAHANA KOMAR	Development of smart healthcare monitoring system in IoT Environment
SAHERABANU MEHABOOBALI NADAF	Development of smart healthcare monitoring system in IoT Environment
SAHIL BENAL	Robotic Lawn mower
SANGAMESH N VANAHALLI	GAIT Analysis
SANGAMESH	LoRaFarm: a LoRaWAN- based smart farming
SANGEETA KOPPARAD	Authentication of IoT devices using Machine learning algorithms
SANKET S WALI	GAIT Analysis
SAVITRI SAJJAN	Development of smart healthcare monitoring system in IoT Environment
SHASHIKALA BIRADAR	Data management in IoT using machine learning

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		SARASWATI HANAMANT BANDIVADDAR	Design and Development of smart polyhouse for agriculture	
		SHIVAPRIYA PARAGI	Find My Maid Software Application	
		SHUBHAM PISE	Vehicle tracking system using mobile application	
		SOUMYA BANDIGANI	Clustering in Wireless sensor network	
		SOUNDARYA BAGADE	Clustering in Wireless sensor network	
		UMA	Bridge Monitoring system using IoT	
		VIJAYALAXMI KALAKERIMATH	Clustering in Wireless sensor network	
		VINAY JANAMATTI	Portable Ventilator	
INDUSTRIAL & PRODUCTION ENGINEERING	IP	ARCHANA R BIDARALLI	ENHANCING THE PERFORMANCE OF SOLAR PANEL USING BIOMETICS	BEC, Bagalkote
		ASHMIDA A ATTAR	ENHANCING THE PERFORMANCE OF SOLAR PANEL USING BIOMETICS	
		ASHWINI SHALDAR	GREEN SUPPLY CHAIN MANAGEMENT IN CEMENT INDUSTRY	
		GANGA G SHETTAR	ENHANCING THE PERFORMANCE OF SOLAR PANEL USING BIOMETICS	
		MANJUNATH KUMBAR	GREEN SUPPLY CHAIN MANAGEMENT IN CEMENT INDUSTRY	
		OMKAR INAMDAR	IMPLEMENTATION OF UNNAT BHARAT ABHIYAN (UBA) SCHEME THROUGH ANALYSIS OF SURVEY DATA OF BHAGAVATHI VILLAGE	
		PRIYA CHANDRAPPA KALAMADI	DESIGN THINKING CONCEPTS APPLIED TO VOICE CONTROLLED WHEEL CHAIR	
		ROHINI P NEELAR	GREEN SUPPLY CHAIN MANAGEMENT IN CEMENT INDUSTRY	
		SANJEEV R JOSHI	INTELLIGENT CARGO MANAGEMENT SYSTEM USING IOT (KSCST APPTOVED PROJECT)	
		SHANE LEON	ENHANCING THE PERFORMANCE OF SOLAR PANEL USING BIOMETICS	
		SHARON EVANGELINE	DESIGN THINKING CONCEPTS APPLIED TO VOICE CONTROLLED WHEEL CHAIR	
		SOURABH R RODAGI	IMPLEMENTATION OF UNNAT BHARAT ABHIYAN (UBA) SCHEME THROUGH ANALYSIS OF SURVEY DATA OF BHAGAVATHI VILLAGE	

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ABHISHEK V TELI	Effortless Lifter And Mover For Infirm Patient
ABHISHEKH TADALGI	Air Duct Cleaning Robot
AJAYKUMAR	Solar Energy Based Purification of Sea Water
AKSHAY LAD	Solar Operated Power Generator For Multi Purpose Usage
AKSHAY UPPIN	Development of Electromotive Multi-Utility Tricycle -part 2 (Emobility and Solar Charging)
AMIT UMESH RATHOD	Solar Operated Power Generator For Multi Purpose Usage
AMOGH N DESHPANDE	Design and Development of Automated Equatorial Tracker Mount
ANIL B ANAGAWADI	Development of Electromotive Multi-Utility Tricycle -part 2 (Emobility and Solar Charging)
BALRAJ	Solar Food dryer
BASANAGOUDA	Air Duct Cleaning Robot
BASAVAPRABHU S BHOVI	Effect of Rolling Process on the Mechanical and Microstructural Properties of Cold Rolled Aluminium
BASAVARAJ MALLAPPA RABAKAVI	Development of Electromotive Multi-Utility Tricycle -part 2 (Emobility and Solar Charging)
BASAVARAJ VITTAL HALLUR	Development of Electromotive Multi-Utility Solar Tricycle Part-1 (Fabrication)
DHANANJAY KATHAVATE	Inbuilt Hydraulic Jack for Four Wheelers
DIVYA	Design and Development of Automated Equatorial Tracker Mount
DUSHYANTHA D S	Effect of Rolling Process on the Mechanical and Microstructural Properties of Cold Rolled Aluminium
KIRAN	Development of Electromotive Multi-Utility Solar Tricycle Part-1 (Fabrication)
KIRAN NAYAK	Wireless Solar Operated Multipurpose grass Cutter
LACHAPPA GOWDA BASANA GOWDA HALEMANI	Solar Food dryer
LINGESH KUMAR SAJJAN	Solar Food dryer

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PRASADAKUMAR MADIKESHWAR	Automatic Irrigation System with PV Solar Trcking
PRASHANT HASILKAR	Pedal Operated Drilling, Grinding and Power Generating Machine.
PRASHEEL MALLIKARJUN LOHAR	Inbuilt Hydraulic Jack for Four Wheelers
PRATHAMESH S HIREMATH	Solar Operated Power Generator For Multi Purpose Usage
PREETAM DANDINAVAR	Design and Fabrication of Fire Extinguisher Based on Low Frequency Sound Waves
PRITHVIRAJ S UPASI	Air Duct Cleaning Robot
RAHUL BAGEWADI	Floating Wireless Oil Skimmer
RAHUL GANIGER	Fabrication of Pedal Operated hybrid disinfected Pesticides Spraying
RAMESH AMALAZARI	Fabrication of Pedal Operated hybrid disinfected Pesticides Spraying
RAMESH KARABANI	Pedal Operated Drilling, Grinding and Power Generating Machine.
RANGANATH TIPARADDI	Zero Radius Turning vehicle
RAVISHANKARGOUDA HIREGOUDAR	Effect of Rolling Process on the Mechanical and Microstructural Properties of Cold Rolled Aluminium
RECHU S MARED	Fabrication of Solar Water Purifier
SACHIN	Design and Fabrication of Foldable Electric Bike.
SACHIN MALLAPPA BYAKOD	Pedal operated water purifier
SACHIN SHIVALINGAPPA YANKANCHI	Zero Radius Turning vehicle
SAGAR GABBUR	Design And Development of Landmine Detection Robot
SAGAR GUNDAPPANAVAR	Zero Radius Turning vehicle
SAGAR SOMASHEKHAR AIHOLE	Design and Fabrication of Effortless Construction Trolley
SANGAMESH BHARAMAGOUDRA	Wireless Solar Operated Multipurpose grass Cutter
SANJAYA BANDI	Investigation of Mechanical Properties of Natural and Hybrid Composite Material using GP resin
SANTOSH HANAMANT TIPPIMANI	Investigation of Mechanical Properties of Natural and Hybrid Composite Material using GP resin
SHAMBHULINGAYYA H M	Wireless Solar Operated Multipurpose grass Cutter

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VIJAY P BADIGER	Remote controlled Weapon system
VIJAY P KARALE	Study on the Effect of ECAP on Microstructure and Mechanical Properties of 5052aluminium Alloy.
VIKRAM H	Investigation of Wear and Corrosion Behavior of Additive Manufactured ti-6Al-4V Alloy.
VIKRANT TOLAGATTI	Fabrication of Solar Water Purifier
VINAYAKA POLICEPATIL	Design And Development of Landmine Detection Robot
VINODKUMAR C VENKATAPUR	Study on the Effect of ECAP on Microstructure and Mechanical Properties of 5052aluminium Alloy.
VISHVESHWAR SANGAMESH SANAKAL	Study on the Effect of ECAP on Microstructure and Mechanical Properties of 5052aluminium Alloy.
ANUSHA C DUGGI	Development of Electromotive Multi-Utility Solar Tricycle Part-1 (Fabrication)
ABHISHEK JAGADISH KUGALI	Fabrication and Testing of Automobile Carbon Filter.
AMOGH I PATTANSHETTI	Analysis And Comparison of Machining Parameters Of Composite Materials Using ANSYS
BASU PATTED	Analysis And Comparison of Machining Parameters Of Composite Materials Using ANSYS
DHEERAJ BASUDE	Fabrication and Testing of Automobile Carbon Filter.
DILEEPKUMAR K BHOVI	Fabrication of Thermoelectric Cooling System using Peltier Effect
GIRISH Y DADMI	Wireless Solar Operated Multipurpose grass Cutter
GURUSWAMI	Fabrication of Rotating Pneumatic Modern Trailer.
HARVI NARENDRA	Vehicular wheel assembly mechanism systems for different road conditions
JAGADEESH TALAWAR	Fabrication of Rotating Pneumatic Modern Trailer.

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		YUNUS NADAF	Vehicular wheel assembly mechanism systems for different road conditions	
ELECTRICAL & ELECTRONICS ENGINEERING	EE	A SHREYA	Implementation of Wireless Stationary Charging System for Electric Vehicles	BEC, Bagalkot
		AJEY J PATTAR	Implementation of Equivalent Circuit Model for Lithium Ion Battery Based on Battery Parameters	
		AMRUTH	Development and Performance Analysis of 1.5 kW SWTG Blades using FG Method	
		AMRUTHA H D	Implementation of Phase Disposition-Pulse Width Modulation Technique for 5-Level Cascaded H-Bridge Inverter using FPGA-Xilinx	
		ASHA CHOUGALA	Implementation of Phase Disposition-Pulse Width Modulation Technique for 5-Level Cascaded H-Bridge Inverter using FPGA-Xilinx	
		ASHUTOSH DAS	Design and Implementation of Circuitry for Automatic Changeover Switch and Generator Starter at EEE Department under Power Failure	
		BANADEVI BILAGI	Design and Development of Algorithm for Phase Identification to Integrate DERs in BEC Distribution Network using AIML	
		BASAVARAJ	Implementation of Wireless Stationary Charging System for Electric Vehicles	
		BHARATH H K	Development and Analysis of DC-DC Boost Converter with P, PI and PID Controller	
		BHARATI RATHOD	Design and Development of Algorithm for Phase Identification to Integrate DERs in BEC Distribution Network using AIML	
		BHAVANA NIDAGUNDIMATH	Implementation of Wireless Stationary Charging System for Electric Vehicles	

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MOHAMMADJUNED INAMADAR	Development and Testing of Water Quantity Based Valve Control Mechanism for Water Distribution Network for Rural Areas
MUBEEN CHOUDHARI	Development and Testing of Water Quantity Based Valve Control Mechanism for Water Distribution Network for Rural Areas
NAGARAJ	Analysis of Lead Acid Battery for Determination on State of Charge Based on Machine Learning
NAGARAJ BHOVI	Analysis of Lead Acid Battery for Determination on State of Charge Based on Machine Learning
NAVEENKUMAR	Development and Performance Testing of SPV Powered Mobile Canteen with DC Loads
NAVEENKUMAR	Development and Implementation of Energy Harvesting System using Piezo-Electric Sensors
NEELAGANGA GOUDAR	Development and Performance Testing of SPV Powered Mobile Canteen with DC Loads
PAVANKUMAR JINNI	Design and Fabrication of SPV Based Robust DC-DC Converters for 5-Level Cascaded Multilevel Inverter
POOJA PATIL	Analysis of Lead Acid Battery for Determination on State of Charge Based on Machine Learning
PRIYANKA ROOGI	Design and Fabrication of SPV Based Robust DC-DC Converters for 5-Level Cascaded Multilevel Inverter
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Sample Photographs of Field Projects

SITE VISIT PHOTOGRAPHS

Fig 21. Crematorium Site Visit at sector no 56

Fig 22. Explanation by Mr.Suresh Teggi Sirat kerudi hospital

Fig 23.Optical fiber base explanation at sector no 86 by Mr. V.K.Chitavadagi sir

Fig 24. Excavation work of Box Culvert at Bagalkot Cement Factory Road

Fig 25. Formwork of Side Drain at Unit – 2 (Sector No 112)

Fig 26. Reinforcement work of drainexplanation by Mr.Basavaraj Malagi sir at Sector No. 112

Fig 27. Water Tank Capacity of 5 Million Litres

Fig 28. Clariflocculator explanation at BTDA water treatment plant by Mr.Mukupi sir

Fig 29. Water testing Laboratory

Fig 30. Slab Reinforcement explanation of Server Hub at Unit – II by Mr.V.K.Chitavadagi sir

Fig 31.Curing of Box Culvert at Basaveshwer PU college cross

Fig 32. Box culvert construction explanation by Mr. Asif Makandar

Fig 1: plan of site 1

Fig 2: 3D view of building

SLAB

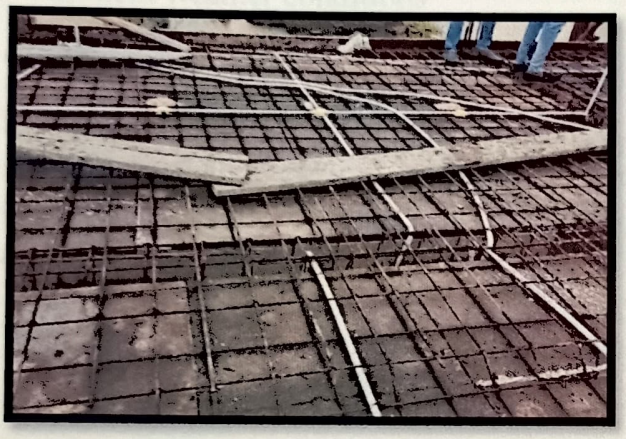
A slab is a structural element, made of concrete, that is used to create flat horizontal surfaces such as floor, roof decks and ceilings. A slab is generally several inches thick and supported by beams, columns, walls, or the ground.

Concrete slabs can be prefabricated off-site and lowered into place or may be poured in-situ using formwork. If reinforcement is required, slabs can be pre-stressed or the concrete can be poured over rebar positioned within the formwork.

Conventional slab: This type of slab is supported with beams and columns, with the load transferred to those elements. A conventional slab is classified as either;

One -way: Supported by beams on two opposite sides, carrying the load along one direction.

Two-way: Supported by beams on all four sides, carrying the load along both directions.



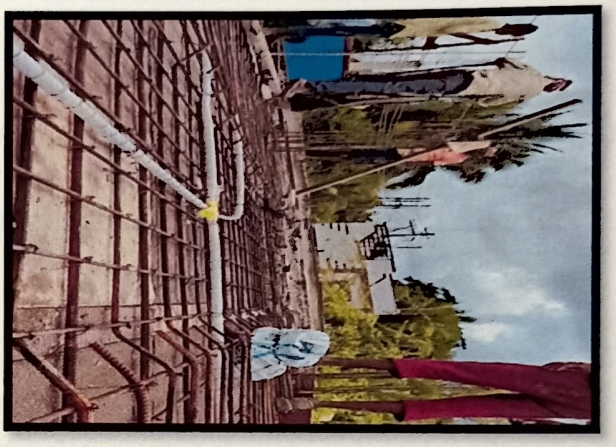


Fig8: Preparation of slab

CONCRETING:

Concrete is widely used in residential construction for footings, walls, and slabs on ground. Mixing transporting and handling of concrete shall be properly coordinated with placing and finishing works. In floor slab, begin concrete placing along the perimeter at one end of the work with each batch placed against previously dispatched concrete.

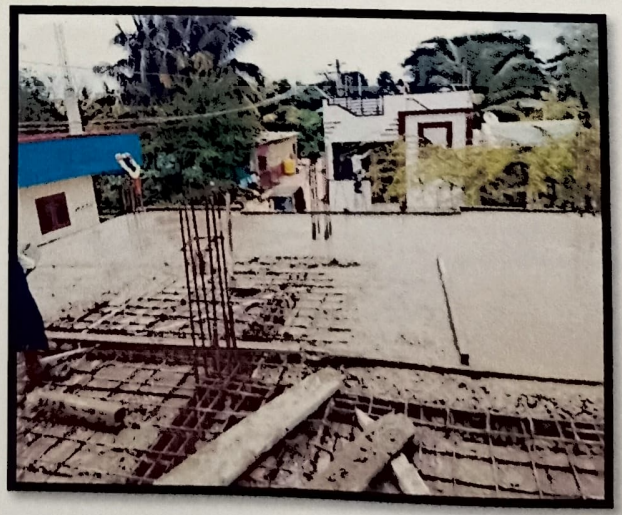


Fig9: concreting of slab

Basaveshwar Engineering College, Bagalkot

Sample Reports of Field Projects/Internship/Student Projects

SHRI B.V.V.SANGHA'S

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS)

Bagalkot-587103

[TEQIP Lead Institute, Govt, Aided AICTE, Recognized, Affiliated to VTU Belgaum]

DEPARTMENT OF CIVIL ENGINEERING

2020-2021

A Report On

EXTENSIVE SURVEY PROJECT

Project guides

Dr. G. M. Hiremath

Dr. Veena S. Soraganvi

Dr. B. R. Hiremath

Prof. S. F. Chitragar

Prof. S. A. Kambli

Prof. G. H. Bandihal

Prof. Seema Shringeri

Dr. S. M. Malakapur

Dr. P. N. Hiremath

Dr. Adarsh Chatra

Prof. G. S. Hiremath

Prof. P. V. Patil

Prof. M. Y. Ganiger

Co-ordinator

Dr. P. G. Rakaraddi

Head of Department

Dr. P. G. Rakaraddi

Submitted by

Mr. NAVEEN BASAVARAJ MATURKAR

(2BA15CV067)

SHRI B.V.V.SANGHA'S
BASAVESHWAR ENGINEERING
COLLEGE (Autonomous) Bagalkot-587103
[TEQIP Lead Institute, Govt, Aided AICTE, Recognized, Affiliated to VTU Belgaum]

DEPARTMENT OF CIVIL ENGINEERING

2020-2021

CERTIFICATE

This is to certify that the project work entitled "EXTENSIVE SURVEY PROJECT" a bonafide work carried out by Mr.NAVEEN BASAVARAJ MATURKAR bearing USN:2BA15CV067 of VII semester in CIVIL ENGINEERING DEPARTMENT of BASAVESHWAR ENGINEERING COLLEGE (Autonomous) Bagalkot during the year of 2020-2021. It is certified that all correction/suggestions indicated for Semester End Examination have been incorporated in the report. The project report has been approved as it satisfies the academic requirements in respect of the project work.

Project guides

Dr. G. M. Hiremath
Dr. Veena S. Soraganvi
Dr. B. R. Hiremath
Prof. S. F. Chitragar
Prof. S. A. Kambli
Prof. G. H. Bandihal
Prof. Seema Shringeri

Dr. S. M. Malakapur
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Dr. Adarsh Chatra
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Prof. P. V. Patil
Prof. M. Y. Ganiger

Co-ordinator

Dr. P. G. Rakaraddi

Head of Department

Dr. P. G. Rakaraddi

External Examiner

1.

2.

Signature with date

ACKNOWLEDGEMENT

It is my greatest pleasure and pride that we present this report before you, at this moment, it is our moral duty not to neglect all those personalities who helped us in the successful completion of Extensive Survey Project work.

I would sincerely thank our beloved principal **Dr.S.S.Injaganeri** for providing fabulous leading environment and wonderful facilities.

I wish to express my sincere thanks to Head of Department **Dr.P.G.Rakaraddi** for his involvement, timely suggestion throughout the course of project work.

First, I would like to thank project guide **Dr. Veena Soragavi, Prof. G.M.Hiremath, Prof. S.F.Chitragar, Prof. G.H.Bandihal, Prof. S.A.Kambli, Prof. M.Y.Ganiger** for their guidance and whole hearted support and very valued constructive criticism that has driven to complete the Extensive Survey Project work successfully. The hard working natures, constant perseverance, commitment to task and ignition to talent have impressed me a lot.

I wish to thank our project co-ordinators Prof. for being a source of technical support, patience and understanding and also for giving an opportunity to carry-out the extensive survey project work.

We also express our heartiest gratitude to all **Faculty Members** and **supporting staff** of Civil Engineering Department for all the suggestions and support provided during this project work.

The good wishes of my parents are also greatly remembered. I would take this opportunity to thank my friend, juniors for their support during the experimental work of the Extensive Survey Project and their encouragement.

Shri B.V.V Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),

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DEPARTMENT OF CIVIL ENGINEERING

REPORT ON

WATER SUPPLY AND SANITARY PROJECT

Under the Guidance of	Project Coordinator	Head of Department
Dr.B.R.HIREMATH	Prof .G.H .BANDIHAL	Dr. P.G.RAKARADDI

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13.	MALLIKARJUN KAMATAGI	2BA18CV040
14.	M D ALTAF	2BA18CV041
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16.	MUSTAK S GADYAL	2BA18CV043
17.	NAVEEN GORANA	2BA18CV044
18.	NAVEEN HIREMATH	2BA18CV045
19.	NAVEEN V PATIL	2BA18CV046
20.	NEELU	2BA18CV047
21.	NETRAVATI P ATTALATTI	2BA18CV048
22.	NIKHIL TIPPANNAVAR	2BA18CV049
23.	NIKHITA HAVALADAR	2BA18CV050
24.	NIKITA MALLESHI PAWAR	2BA18CV051
25.	NIKITA V AWATI	2BA18CV052
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Shri B.V.V Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),

BAGALKOT-587102.

2021-2022

DEPARTMENT OF CIVIL ENGINEERING

REPORT ON

WATER SUPPLY AND SANITARY PROJECT

Under the Guidance of	Project Coordinator	Head of Department
Dr.B.R.HIREMATH	Prof .G.H .BANDIHAL	Dr. P.G.RAKARADDI

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12.	LAKKAPPA SHIRAGUMPI	2BA19CV413
13.	PRITY PRIYA A DUTTA	2BA19CV419
14.	SANA KOUSAR MUDDEBIHAL	2BA19CV426
15.	HEENAKOUSAR SAIYYAD	2BA19CV407
16.	RAVIKUMAR P DODAMANI	2BA19CV421
17.	BABU RANGAPPA KAMBAR	2BA19CV404
18.	AISHWARYA WAGH	2BA19CV400
19.	RAVI P HADIMANI	2BA19CV420
20.	JAYASHREE S JOGIN	2BA19CV409
21.	NANDINI KALAWAD	2BA19CV417
22.	SHOBA CHILAKANDI	2BA19CV429
23.	ASHWINI ALABAL	2BA19CV402
24.	MALLIKARJUN	2BA19CV415

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BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),

BAGALKOT-587 102

(Government Aided Institution and permanently affiliated to Vishveshvaraya Technological University,Belagavi.Accredited by NAAC with 'A' grade from 2017-2022)

DEPARTMENT OF CIVIL ENGINEERING

INTERNSHIP TRAINING REPORT

Submitted in partial fulfilment of requirements for the award of the degree

BACHELOR OF ENGINEERING

In

CIVIL ENGINEERING

2021-2022

Name of the Authority

BAGALKOT TOWN DEVELOPMENT AUTHORITY

Internship Authority/Firm Name

Mr.Manmathayya.M.Swamy

Chief Engineer, BTDA Bagalkot

Internship Co-ordinator.	Head of Department
Prof. G.H.Bandihal	Dr. P.G.Rakaraddi

Submitted by

NAME	USN
MR.PRAMOD PADAKI	2BA19CV418

Shri B.V.V.Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),

BAGALKOT-587 102

(Government Aided Institution and permanently affiliated to Vishveshvaraya Technological University, Belagavi accredited by NAAC with 'A' grade from 2017-2022)

CERTIFICATE

This is to certify that the conducted "INDUSTRY INTERNSHIP TRAINING REPORT" is a bonafide work carried out by MR.PRAMOD B PADAKI bearing USN:2BA19CV418 in a partial fulfilment of the requirements for the award of Bachelor of Engineering degree in the Civil Engineering of BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS) BAGALKOT during the year 2020-2021. The report has been approved as it satisfies the academic requirements in respect of INTERNSHIP TRAINING prescribed for the said degree.

Under the Guidance of	*Internship co-coordinator.*	*Head of department*
Mr.Manmathayya.M.Swamy	*Prof.G.H.Bandihal*	*Dr. P.G.Rakaraddi*
Chief Engineer		

Name of Examiners	*Signature of the Examiners*
*1.*_____	*1.*_____
*2.*_____	*2.*_____
*3.*_____	*3.*_____

BAGALKOT TOWN DEVELOPMENT AUTHORITY, BAGALKOT.

No:CE/BTDA/PB-1/2016-17/

Office of the Chief Engineer,
Bagalkot Town Development Authority
Bagalkot.

Date: 18-10-2021

CERTIFICATE

Date 18-10-2021

This is to certify that **Mr. Pramod Padaki** bearing USN **2BA19CV418** has undergone Industrial training at our organization from **01-09-2021 to 28-09-2021**

The Trainee was found to be regular, punctual and attentive during the period of training at our organization.

Chief Engineer,
B.T.D.A.,Bagalkot.

ACKNOWLEDGEMENT

The satisfaction and ecstasy that the successful completion of any task would be incomplete without the mention of the people who made it possible. By whose consistent encouragement crowned our efforts with success. I consider it my privilege to express my gratitude and respect to all those who guided me in completion of my internship.

I perceive this opportunity as a big milestone in my career development. I will strive to use the skills and knowledge gained, in the best possible way and I will continue to work on their improvement, in order to attain my desired career objectives.

First of all, I express my sincere thanks,

For permitting me to undertake this venture. I also express my deep gratitude to **Chief Engineer of Bagalkot Town Development Authority, & also Assistant Executive Engineer's, Assistant Engineer's & Junior Engineer's** for their guidance & unflagging support and patience.

I would like to thank all members of Bagalkot Town Development Authority for their valuable contribution throughout my internship.

I would also express my gratitude to **Dr.P.G.Rakaraddi Head of Civil Engineering Department & Prof.G.H.Bandihal** Internship co-ordinator Department of Civil Engineering, Basaveshwar Engineering college Bagalkot.

Lastly I would like to thank my parents for their unwavering support without which I would not have been successful

In all sincerity,

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ABSTRACT

A. NEED OR AIM OF THE INTERNSHIP

The aim of this internship is to permit the students to practice theoretical or academic knowledge required during four years of engg and to familiarize to professional realities. To provide the student an opportunity to apply knowledge, skills and experiences gained during the academic program to a professional setting.

The specific objectives are:-

- To apply theory in a practical environment.
- To establish groundwork and provide networking for professional development and growth in a career.
- To further help students recognize their own strengths and weaknesses both personally and professionally.
- To facilitate students as they assess personal ambitions in their chosen field.
- To prepare students for employment or graduate education.

B. ABOUT BAGALKOT TOWN DEVELOPMENT AUTHORITY

Bagalkot is one of the major town in north Karnataka State, which is affected in phase II and please III of stage of Upper Krishna Project. Bagalkot town will be submerged under back water of Almatti reservoir at different elevations. Different portions of Bagalkot town will be affected gradually as the storage level of Almatti dam increases.

Resettlement plan consists of acquisition of land for locating the new Bagalkot town and making all arrangements to provide basic infrastructure in the new township. For this purpose the state government has been enacted a special legislation called 'BAGALKOT TOWN DEVELOPMENT ACT 1993'. The act provides for establishment of separate autonomous authority to plan, develop and manage the resettlement and rehabilitation of PDF's of the old Bagalkot town as well as to create a modern township. The authority is headed by a non-official Chairman and it also provides membership for non-official representatives. A Chief Engineer designed as its Chief Executive. The board of the B.T.D.A. also has secretaries to the Government (of all relevant departments) as its members. So far BTDA has mainly dealt with resettlement and rehabilitation of PDF's. Funds has been provided for this project by the government up to 1995 and afterwards the KBJNL Bangalore has been funding.

C. ABOUT THE WORK FIELD:

The project stretch starts at Kerudi cancer hospital and Cement factory circle to Raichur - Bachi road, Bagalkot. The total considered length for improvements is 1.58km. The project stretches pass through Plain/Rolling Terrain. Some private layouts with prominent structures like Hospitals, Commercial complex and medical collage have come up all along this road. This is are main interlinking roads from Navanagar Unit-1, Unit-III (to be developed) to old Bagalkot, Cement Factory, Medical College, APMC and existing Raichur – Bachi road. I have visited the another site which is at Basaveshwar PU college it is the one of the main road connecting to Vidyagiri and the total stretch was 625 m work started from Raichur highway cross to college circle.

D. TASKS PERFORMED DURING THE INTERNSHIP:

Whereas Road construction activities were carried out at site they are,

1. Marking out the levels of road crust ,levels of drain,Box culvert.
2. Centerline marking of Rcc drain.
3. Construction of road embankment.
4. Formwork for Rcc drain.
5. Reinforcement and bar bending of Rcc drain and Box culvert.
6. Checking out the measurements of work done in the site according to the specifications and estimation and looking at the Construction steps and being explained the site engineer.
7. We learn the process of construction by looking at various process like laying of form work, concreting of the slab and drains and Reinforcement.
8. Also learn the various materials used for Construction and how much quantity of the materials required for the construction work.

E. OUTCOMES:

1. Management of the labours and the Construction materials at site.
2. Management of cost at site and making it most economical as much as possible.
3. Identify the specific design, process and decision to reduce or eliminate the potential for failure.
4. Learn from the others experience to avoid the pitfalls and minimizing the repetition of errors in work.

CHAPTER – 01

INTRODUCTION

1.1 TECHNICAL REASON FOR SELECTION OF THE PARTICULAR FIELD:

The aim of this internship is to permit students to practice theoretical or academic knowledge required during four years of student and to familiarize to professional realities. To get an opportunity to apply knowledge, skills and experiences gained during the academic program to a professional setting. I choose Bagalkot Town Development Authority (BTDA) a Government body. For this internship training for a close observation of work related to Civil Engineering and application of my academic knowledge in practical field. In this internship, I have focused on my main target that was to get a complete overview of Public construction works (Civil) under Bagalkot Town Development Authority.

1.2 BASIC TERMS OF THE FIELD:

1. **SCHEDULE OF RATES:** A schedule of rates is a list in a contract setting out the staff, labour and plant hire rates etc that a contractor will use for pricing cost reimbursable work.
2. **EMBANKMENT**: An embankment refers to a volume of earthen material that is placed and compacted for the purpose of raising the grade of a roadway (or railway) above the level of the existing surrounding ground surface.
3. **BIM: BIM (building information modelling)** is the process of creating a computer model of a building that includes all of the details of that structure, from its basic layout to the smallest measurements.
4. **BOQ:** The bill of quantities is a contract document that contains a list of materials and workmanship involved in a construction project. It is necessary for properly pricing a project.
5. **Field measure:** Taking measurements within the structure itself rather than relying on blueprints.
6. **Reinforced concrete:** Concrete that is strengthened by adding steel bars or mesh within the concrete.
7. **Blueprints:** A 2-dimensional technical drawing that has all of the project's details.
8. **Design-Bid-Build:** A traditional project delivery method where the owner or agency contracts separate firms to design and construct the building.

9. **Public-Private-Partnership:** A project delivery method where a government agency and a private sector company collaborate to fund, build and maintain construction projects as the private generates income from the project.
10. **Target Value Design:** This design method involves all key stakeholders — including the owner, subcontractors, designers and contractors — who will design the construction project to meet the owner's goals and budget.
11. **Foreman**: The leading supervisor at the construction site who is in charge of the work crews. He ensures workers perform daily tasks based on established schedules while creating documents regarding completed work.

1.3 BRIEF DESCRIPTION OF THE TECHNOLOGY OR WORK:

- **Reconnaissance Survey:**

The consultants made an in-depth study of the available land width (ROW), topographic survey maps of the project area and other relevant information were collected. A detailed reconnaissance survey was conducted on the total project area and an assessment of possible alignment change at places, if required, was also made. Detailed features such as land-use, habitation, water routes, utilities such as electrical lines (HT/LT), etc. were also noted down.

- **Topographical Survey:**

Topographic survey using total station equipment was conducted and a contour map shall be prepared showing contour line drawn at an interval of 0.5m, it also indicate all the prominent existing features such as roads, railway tracks, colonies, (independent houses also), power lines, water bodies, farms, gardens, fields etc. Few reference stones were marked on the survey map and their levels were enlisted (smaller to larger scales). Providing and fixing of boundary stones at an interval of 50m and additionally wherever bends occurs was done as per the directions of Engineer In charge. project influence area was utilized for planning and programming the detailed surveys and investigations.

- **Block Level Survey:**

Block level survey was taken up and a contour map was prepared showing contours at intervals of 0.5m. The RL was indicated based on either an established TBM, if available, or with reference to a TBM established.

- **Office Processing:**

The field survey will be processed in the office to provide a digital output file for the design engineers.

The Surveyor will arrange for a proof survey for a statistical sample to check the digital maps in the field.

The data will be structured so that the vertical profile of the proposed alignment can be produced automatically. The format of the resulting data will be such as will readily promote the calculations of earthworks and other quantities required for the evaluation of detailed cost estimates.

- **Test Pit Investigation :**

Test pit investigation survey of the road sections spread over the entire road section has been carried out. At each location, large test pits of 1.0 mx 1.0 m were dug at pavement-shoulder (pavement edge) interface up to sub grade level in a staggered manner along the existing road alignment to assess the pavement details (such as layer type, thickness and material). In-situ tests to determine field density such as Core cutter test or sand replacement test depending upon the soil type also has been done. Subgrade soil samples have been collected and tested in the field/ laboratory for assessing its strength characteristics such as, field moisture content, in-situ density test, grain size analysis and CBR test on 4-day soaked samples.

- **CBR Value**:

The California Bearing Ratio (CBR) is a measure of the strength of the subgrade of a road or other paved area, and of the materials used in its construction. The ratio is measured using a standardized penetration test first developed by the California Division of Highways for highway engineering.[1] Empirical tests measure the strength of the material and are not a true representation of the resilient modulus

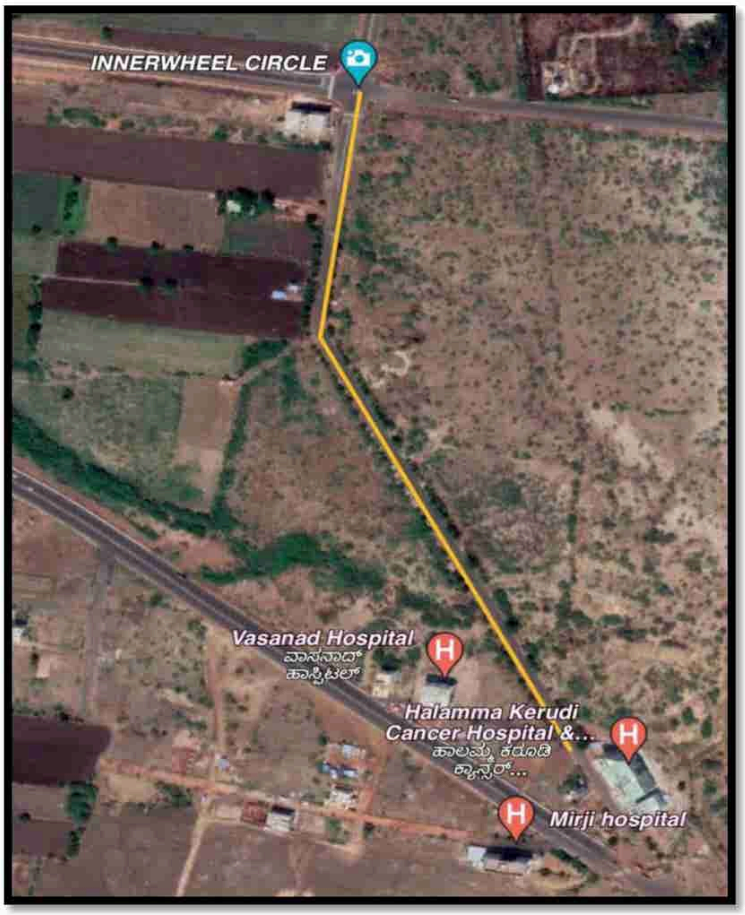
- **Road Side Drainage:**

An effective drainage system shall be planned for the drainage of roadway as per stipulations of IRC SP: 42-1994 for maintaining structural soundness and functionality of the project road.

- **Pavement Design:**

The design is based primarily on IRC Guidelines. For the design of the overlays for the existing lane pavement, the strengthening work takes due considerations of the strength of the existing pavement. The overlay thickness has been worked out for road segment in relation to condition, strength and sub-grade characteristics.

1.4 STUDY AREA DESCRIPTION,SPECIALITY AND LOCATION(MAP):



Map location: Kerudi cancer hospital to cement factory circle.

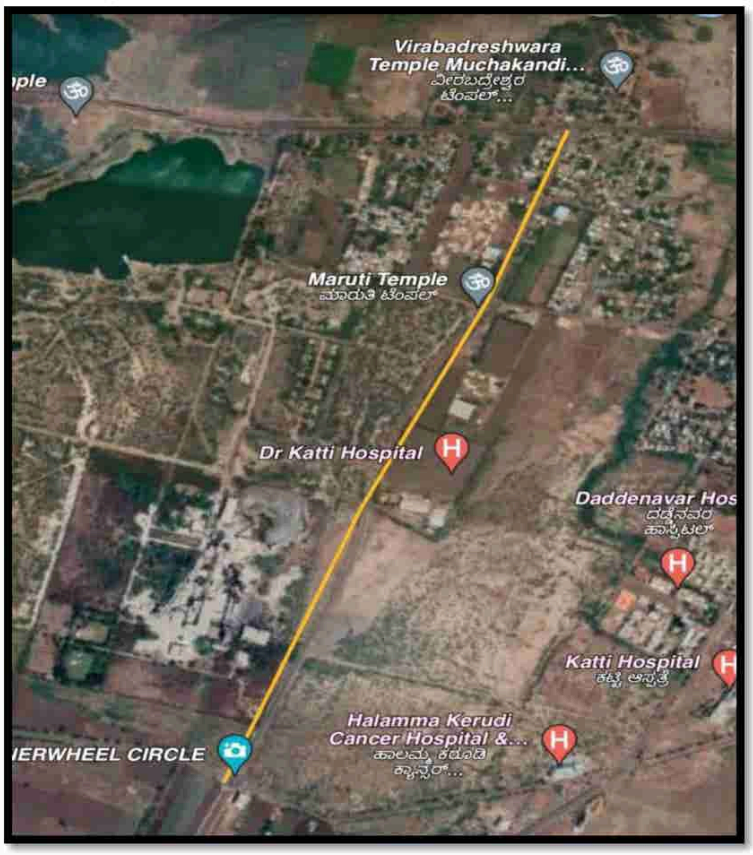
Work Speciality: Construction of 4 lane road and cross drainage work.

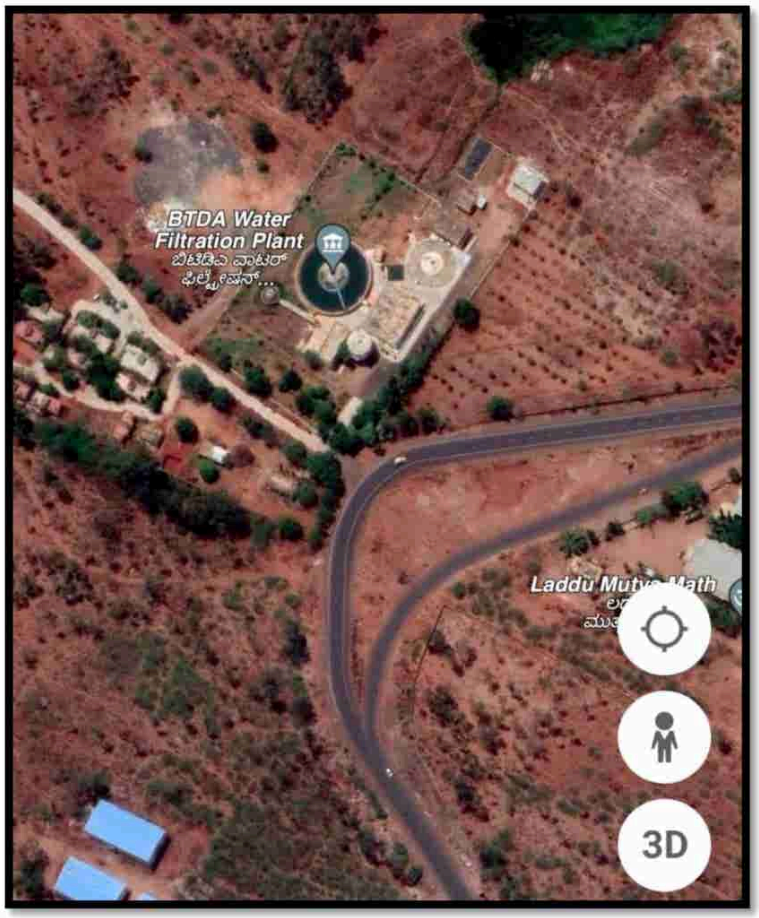
Study area description: The road was 800m and construction of GSB and WMM layer and Curing of box culvert.

Map location: Muchakandi cross to cement factory.

Work Speciality: Construction of 4 lane road and cross drainage work and Retaining wall.

Study area discription: The road was 1800m and construction of Sub grade,GSB and WMM layer and excavation for box culvert.





Map location: BTDA Water treatment plant.

Work Speciality: Treatment of raw water different steps and pumping to the GSLR.

Study area discription: Plant receives the water from Krishna back water Ghataphraba river through Jack well and daily treat the water of QTY 17.5 MLD Litter.capacity of treatment plant is about 27 MLD

Map location: Basaveshwar PU college to NH-367 Raichur Highway.

Work Speciality: Construction of 4 lane road, Retaining wall and cross drainage work.

Study area discription: The road was 625m.Excavation for road and construction of WMM layer and construction of side walls and slab of box culvert.

1.5 WEEKLY PROGRESS IN THE FIELD OF CONSTRUCTION:

WEEK 1

- In the 1st week of internship I have visited to the site at near kerudi cancer hospital where I observe the construction process of road and cross drainage work.
- I have learned the Construction of GSB layer, WMM layer and also the requirements of Box culverts and locationing of culverts.
- I have also visited to the site near Railway station where the DBM and Pavement work is carried out.

WEEK 2

- In the second week of Internship I have visited to the site at near MUCHAKHANDI cross where excavation for Retaining wall is going and extinction of two lane road construction was going .
- In the site the site engineer has explained about the taking of levels of the road crust, side drain.
- Checked the measurements and levels of the construction work done according to the specifications and estimation.

WEEK 3

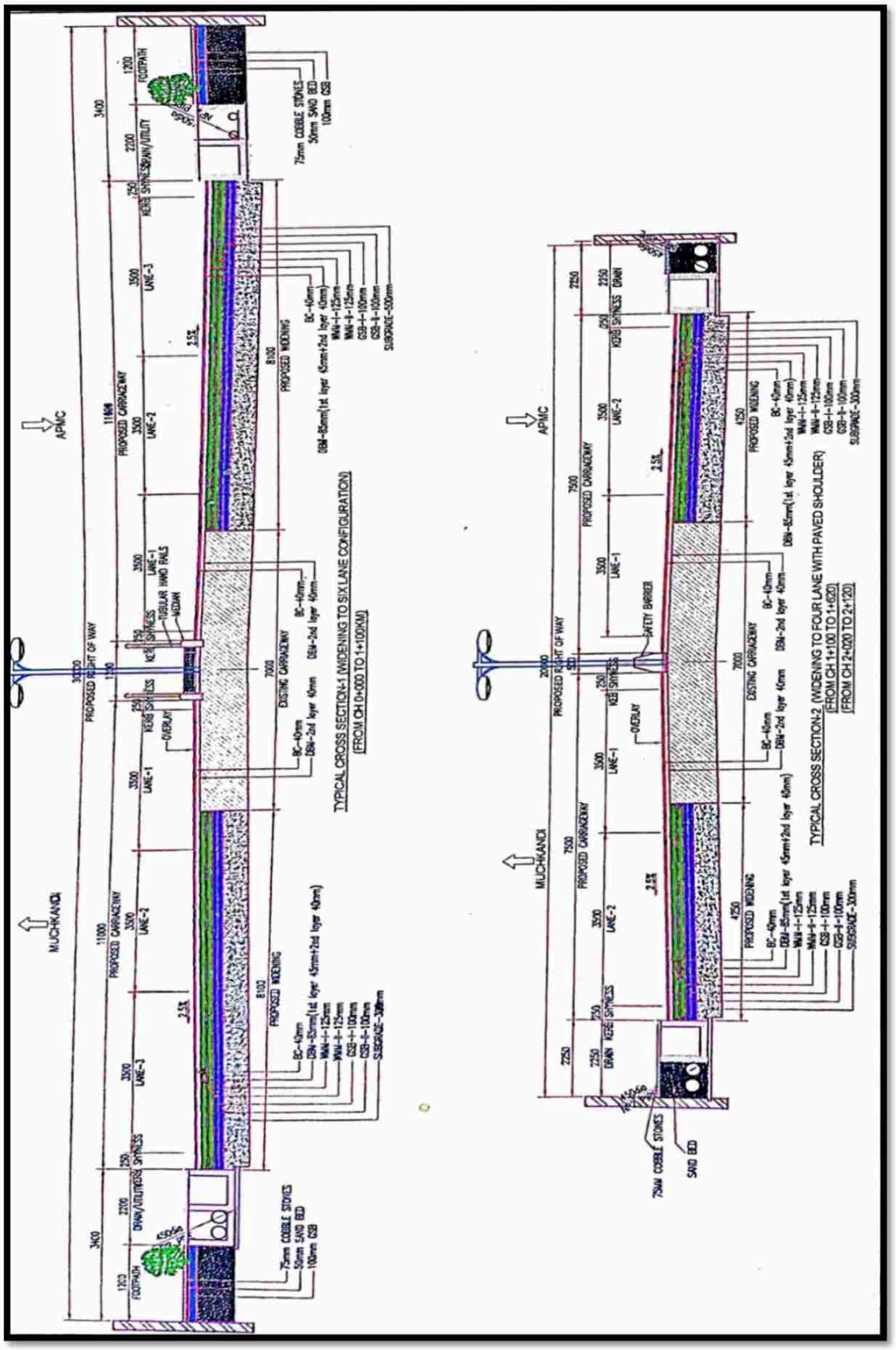
- In the 3rd week of internship I have visited to the BTDA Water treatment plant near Gaddankeri.
- In the water treatment plant I have seen the different steps involved in the treatment of raw water and quantity of dosage of different chemicals added to water.
- I have also visited to the site where construction of Rcc drain work is carry outing and learn about the reinforcement of drain and form work involved.

WEEK 4

- In the 4th week of internship I have visited to the site near police palace where the embankment construction of road work is carry outing
- I have visited to the sector no112 where the laying of optical fiber base cables going for the purpose of internet connection.
- I have also visited to the site near Basaveshwar PU college where the construction of road work and reinforcement of retaining wall work is going.

CHAPTER – 02

TYPICAL CROSS SECTION AND CREST DETAILS



2.1 GENERAL:

The proposed improvement is to be carried out to make it a good infrastructure for improvement of industrial configuration in all respects. The terrain on this stretch is rolling. This section describes the standards and principles based on which various designs will be carried out. These proposed standards are consistent with the parameters recommended in the relevant standards of the Indian Roads Congress (IRC). The aim of this chapter is to evolve design standards and material specifications for the study, which is primarily based on IRC publications and MoRT&H circulars and relevant standards.

2.2 Design Principles:

a) Designs-(Methodology):- The design Methodology as per IRC has been followed.
b) Traffic survey and growth:-Traffic survey for 7 days has been conducted. The growth rate of 5% has been considered as per IRC 37-2012.
c) CBR details and methods proposed for improving the CBR:- Based on the existing
d) CBR of the subgrade the crust has been designed
e) Crust Designs:-The Crust has been designed based on projected intensity of traffic and CBR, as per IRC 37-2012
f) Design of circles:-The design of circle has been done as per IRC Special Publication - 41 reprinted in 2012.
g) The design Period has been considered as 20years, The Construction period has been considered as 3years accordingly the traffic has been projected.

2.3 CROSS SECTIONAL ELEMENTS OF A ROAD

The characteristics of cross-sectional elements are important in highway geometric design because they influence the safety and comfort. The 6 basic cross sectional elements of a highway pavement are

1. Camber
2. Width of Carriage way
3. Road Margin
4. Width of Formation
5. Right of Way (ROW)
6. Median

1.CAMBER:

Camber or cant is the cross slope provided to raise middle of the road surface in the transverse direction to drain off rain water from road surface.

Too steep slope is undesirable for it will erode the surface. Camber is measured in *1 in n* or *n%* (E.g. 1 in 50 or 2%) and the value depends on the type of pavement surface. **The proposed road is provided with the slope about 2.5 % of total width of road.**

2.WIDTH OF CARRIAGE WAY:

Width of the carriage way or the width of the pavement depends on the width of the traffic lane and number of lanes. Width of a traffic lane depends on the width of the vehicle and the clearance. clearance improves operating speed and safety. The maximum permissible width of a vehicle is **2.44** and the desirable side clearance for single lane traffic is 0.68 m. This require minimum of lane width of 3.75 m for a single lane road. **The proposed width of Carriage way with two lane road is about 7.50 m and width of carriage way with three lane section is 11.0m.**

3.KERBS:

Kerbs indicate the boundary between the carriage way and the shoulder or islands or footpaths. **The proposed road is provided with kerb sharpness of 0.25m**

4.ROAD MARGINS:

The portion of the road beyond the carriageway and on the roadway can be generally called road margin. Various elements that form the road margins are given below.

A. **Foot Path:** A footpath (also pedestrian way, walking trail, nature trail) is a type of thoroughfare that is intended for use only by pedestrians and not other forms of traffic such as motorized vehicles, cycles, and horses.**1.2m wide Foot paths are provided in proposed cross section.**

5.WIDTH OF FORMATION:

Width of formation or roadway width is the sum of the widths of pavements or carriage way including separators and shoulders. This does not include the extra land in formation/cutting. **The total width of formation provided is about 30.0m.**

6.RIGHTOFWAY(ROW):

Right of way (ROW) or land width is the width of land acquired for the road, along its alignment. It should be adequate to accommodate all the cross-sectional elements of the highway and may reasonably provide for future development. To prevent ribbon development along highways, control lines and building lines may be provided. Control line is a line which represents the nearest limits of future uncontrolled building activity in relation to a road. Building line represents a line on either side of the road, between which and the road no building activity is permitted at all.

The importance of reserved land is emphasized by the following. Extra width of land is available for the construction of roadside facilities.

7.MEDIAN:

The median strip or central reservation is the reserved area that separates opposing lanes of traffic on divided roadways, such as divided highways, dual carriageways, freeways, and motorways. The term also applies to divided roadways other than highways, such as some major streets in urban or suburban areas. **The proposed road cross section provided with a median of width of 1.2m and provided with street lights at a interval of 30.0m**

3.4 CRUST DETAILS OF FLEXIBLE PAVEMENT:

Overlay for Road is designed taking into consideration of CBR value. For Paved shoulders. Earthwork for cutting by mechanical means is provisioned. Prior to earthwork in embankment, compaction of original ground with power roller is considered. For earthwork in embankment soil and earth for subgrade is proposed from borrow pits inclusive of median and shoulders.

Road Pavement Crust is composed of the following components:

1) Surface/Wearing Course
2) Base Course
3) Sub Base
4) Sub Grade

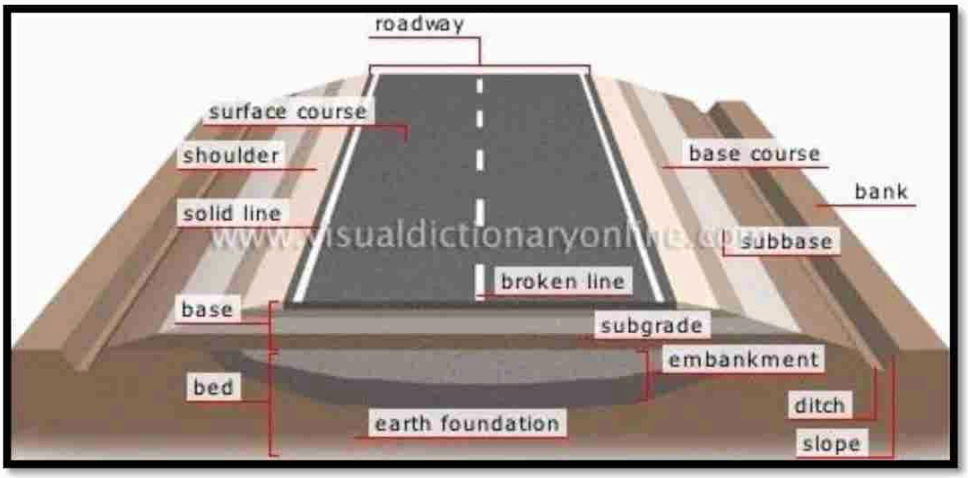


Fig 2. Crest of Flexible pavement

1. Surface/Wearing Course in pavement cross section:

The top layers of pavement which is in direct contact with the wheel of the vehicle. Usually constructed of material in which bitumen is used as binder materials.

a. Bituminous Pavement:

Consists of combination of mineral aggregate with bituminous binder ranging from inexpensive surface treatment ¼ in or less thick to asphaltic concrete. For good service throughout the full life bituminous pavement must retain following qualities.

- Freedom from cracking or ravelling.
- Resistance to weather including the effect of surface water heat and cold.
- Resistance to internal moisture, particularly to water vapours.
- Tight impermeable surface or porous surface (if either is needed for contained stability of underlying base or subgrade).
- Smooth riding and non skidding surface.

2. Base course

It is the layer immediately under the wearing surface (Applies whether the wearing surface is bituminous or cement concrete and or more inch thick or is but a thin bituminous layer). As base course lies close under the pavement surface it is subjected to severe loading. The material in a base course must be of extremely high quality and its construction must be done carefully.

Types of Base Course

1. Granular Base Course
2. Macadam Base
3. In-water bound Macadam

4. Treated Bases

3. Sub Base:

It is layer of granular material provided above subgrade generally natural gravel. It is usually not provided on subgrade of good quality. It is also called granular subbase.

a. Function of Sub base in Road Cross Section

- It enables traffic stresses to be reduced to acceptable levels in sub-grade in the Road Cross Section so that excessive deformation is prevented.
- It acts as a working plate form for the construction of upper pavement layers.
- Acts as a drainage layer, by protecting the sub grade from wetting up.
- It intercept upward movement of water by capillary action.
- It acts as a separating layer b/w subgrade and road base. By this it prevent the two layers from mixing up.

b. Characteristics of materials used in Sub Base:

The subgrade material should be clean and free from organic matter and should be able to be compacted by roller, to form stable sub-base. The material should have following characteristic.

- Well graded uniformity coefficient (D60/D10) should not be less than 3.
- Fraction passing sieve #200 shall not be greater than 2/3rd of the fraction passing sieve #40.
- Should have a L.L not greater than 25%.
- P.I not greater than 6
- CBR should not be less than 25
- In coarse grain, aggregate retained by #10 sieve, %age of wear shall not be greater than 5%.
- The max dia of any particle shall not be greater than 2/3ed of the layer thickness of sub-base.

4.Sub Grade:

Consists of the naturally occurring material on which the road is built, or the imported fill material used to create an embankment on which the road pavement is constructed. Subgrades are also considered layers in the pavement design, with their thickness assumed to be infinite and their material characteristics assumed to be unchanged or unmodified. Prepared subgrade is typically the top 12 inches of subgrade.

Formation level defined as the final level of soil surface after completion of earthworks and when trough the process of compaction, stabilization and reinforced The subgrade's main function as to withstand the loading of road pavement (sub base, base, etc.) above it.

A) Road Crust details:

i) Existing Road Crust

WBM (Water Bond Macadam)	=150MM
BT (Bituminous Tar)	=75MM
Total.	**=225MM**

ii) Proposed Road Crust

GSB (Granular Sub Base).	=200MM
WMM (Wet Mix Macadam).	=250MM
DBM (Dence Bituminous Macadam).	=85MM
BC (Bituminous Concrete)	=40MM
Total.	**=525MM**

CHAPTER NO-3

MATERIALS, DIFFERENT CONSTRUCTION ACTIVITIES AND METHODOLOGY

3.1 Materials:

Soils and materials investigation for a road project is an essential requirement for design and construction. During design stage of the road pavement, embankment and other structures, the existing soils and materials inventory is needed for their characteristics, availability of required quality and sufficient quantity for construction at reasonable cost.

The project will require different type of construction materials, which include:

- Soil for embankment, subgrade and shoulder
- Granular materials for sub-base, drainage layer and backfill
- Stone aggregate and sand for pavement courses and cement concrete works
- Water for use in construction specially in case of cement concrete

The Consultants have collected information on the availability and suitability of the above Material from existing sources. The approved aggregate quarry is near. Further the prevailing market rates of construction materials such as sand, aggregates, Murrum, cement and steel were gathered through enquires in Bangalore. Their quality, source and associated leads were also gathered..

3.2 WORKS ASSIGNED:

3.2.1Construction methodology for flexible pavement:

1) CLEANING AND GRUBBING:

Procedure:

The work shall commence soon after mobilization at the site has been completed to the extent that this activity can be taken up. Clearing and grabbing shall be carried out using bulldozers to generally scrap off the top crest of the formation bed with the main aim to clear the proposed road corridor of major bushes, unwanted waste materials and vegetation and roots so as to enable field survey works to be carried out up to reasonable precision and

accuracy besides conducting soil sampling and ad testing, visual or laboratory, on the existing ground materials to enable decision on further course of action on mode of road construction.

1. Dozer
2. Excavators
3. Tippers

2) EARTHWORK IN EXCAVATION:

Procedure:

1. Before the earthwork is started the whole area where the work is to be done should be cleared of grass roots of trees and unwanted debris.
2. Excavation should be carried out exactly in accordance with the dimension shown on the drawings or any other dimension, as decided by the Ste-in-Charge.
3. Sides of the trenches shall be I be vertical and its bottom shall be perfectly levelled. both longitudinally and transversely.Where the soil is soft, lose or slushy, the touch shall be widened for allowing steps on either side or the sides sloped or shored up.
4. During excavation if nocks or rocky soils are found, they shall be levelled as far as possible and the small spaces which are difficult to level shall be filled in with
5. If the excavation is in earth, the bottom of the trenches shall be sprinkled with a little water and rammed.
6. No material excavated from the foundation trenches shall be placed nearer than one meter to the outer edges of the excavation.
7. Water in trenches must be hailed or pumped out and where it is apprehended that sides may fall down or cave in, arrangement shall be made for adequate timber shoring.
8. When it is specified that the work is to be carried out without removing cables, pipes, sewers etc. All of them shall be temporarily shored and saved from any damage.
9. The cost of all material and labour required for fencing/barricading in and protection against risk of accidents due to open excavation should be provided.

Equipment used:

1. Excavators
2. Tippers
3. Water Pumps

3) EMBANKMENT CONSTRUCTION:

Procedure:

1. The toe line and centre line are marked and pegs will be driven.
2. The material shall be dumped in site at respective location.
3. The material shall be spread in layers of uniform thickness exceeding 200mm compacted thicknesses over the entire width of the embankment by mechanical mean and will be graded with motor grader to the required camber.
4. Moisture comment of the material shall be checked and extra required will be added.
5. The moisture content of each byer shall be checked and it should be within range of OMC +1% to OMC 2%. If moisture content is found out of these limits the same will be brought within the limits by addition of water or by aeration as the case may be.
6. The compaction shall be done with the help of vibratory roller of 8 to 10 ton static weight. Each layer shall be thoroughly compacted to the densities specified.
7. Loose pockets if any will be removed and replaced with approved material.
8. The above stage shall be repeated till the top level of the embankment is reached to the specified tech and grades. The top levels are checked and shall be within the +20 and 25mm of the designed level.

Fig 3. Subgrade construction of road

6.SUBGRADE AND GRANULAR SUB-BASE CONSTRUCTION:

Procedure:

1. The toe line and center line are marked and pegs will be driven.

2. The material shall he dumped in site respective location.
3. The material shall be spread in layers of uniform thickness not exceeding 200mm compacted thicknesses over the entire width of the subgrade by mechanical mean and will be graded to the required camber.

Fig. 4. Laying of Granular Sub Base layer

4. Moisture comment of the material shall be checked and extra required will he added.
5. The moisture content of each layer shall be checked and it should be within the range of OMC +15% to OMC-2%. If moisture content is found out of these limits the same will be brought within the limits by addition of water or by aeration as the case may be.
6. The compaction shall be done with the help of vibratory roller of 8 to 10 ton state weight. Each layer shall be thoroughly compacted the densities specified.
7. Loose pockets if any will be removed and replaced with approved material.
8. The above stages shall be repeated till the top level of the embankment is reached to the specified level and grades. The top levels are checked and shall be within the +20mm and -25mm of the designed level

4) WET MIX MACADAM (WMM) CONSTRUCTION:

Preparation of Mix

The individual materials gradation shall be checked and combined proportions shall be Mixed.

LAYING OF WMM-BASE:

1. Scope: Wet mix macadam base shall consist of laying and compacting clean. Crushed graded aggregate and granular material premixed with water to a dense mas on prepared sub base in accordance with the specifications.
2. Proposed Sample: Coarse aggregate proposed to be used in WMM are obtained by crushing the rocks, obtained from approved quarries. Before removing the rock. Quarry area is stripped of earth loam clay and vegetable matter.

Independent tests will be carried out on the material as follows:

I. Sieve analysis
II. Los Angeles Abrasion test
III. Aggregate impact value
IV. Combined flakiness and elongation indices.
V. Modified proctor density
VI. Liquid limit, plasticity index of proportion through 425 Micron sieve.

Fig.5 laying of wet mix at kerudi hospital

3. Mixing Proposed Base material will be obtained by mixing various sizes of aggregates (as per approved max design) & water in the wet mix macadam plant.
4. Transportation: W.M.M. material will be carried to the site in dumpers of adequate capacity.
5. Laying and compaction: WMM. material will be laid in layers (150 mm compacted) on prepared sub base using mechanical pavers or motor grader to maintain required thickness and slope and to achieve finished surface in narrow areas, WMM will be spreaded manually, in layers.
6. Each layer will be compacted with 10 TV ibeo Roller, to achieve required degree of compaction Le. 98% of modified density. The areas not accessible to roller will be compacted with plate compactor or mini rollers.
7. Top surface will be checked for its designed levels before & after compaction & material will be removed or added as required.

5.APPLICATION OF PRIME COAT:

Preparation of Road Surface: Make clean the top surface of wet mix macadam by engaging labours with wire brush and all organic contents shall be blown up by using compressed air. The surface to be primed will be swept clean, free from dust and remain dry.

Application of Primer:

The primer will be sprayed uniformly over the dry surface using a self-propelled sprayer with the distribution bar at temperature of 30 to 60 degree centigrade.

6.DENSE BITUMINOUS MACADAM (DBM):

CONSTRUCTION PROCEDURE:

Laying of DBM:

The mix shall be laid with paver finisher. The paver shall have suitable loading hoppers and distribution mechanism The paver shall have electronic sensor paver and string wire shall be run on steel pegs driven on both sides at 10 m interval in straight portion and 5m interval in curved portions. The mix shall be laid manually in places where the paver movement is not possible. The compaction of DBM shall be done as per clause 501.6 and 501.7. The rolling shall be done with 80-100 KN smooth wheeled tandem rollers, 12-15 tones pneumatic tired rollers. The DBM should be laid in 2 layers.

7. BITUMINOUS CONCRETE LAYER (BC):

Fig. 6 Laying of Bituminous concrete at 48 sector

3.2.2 ROAD DRAINAGE SYSTEM:

The process of removing and controlling the access of surface and subsurface water within the right-of-way of a road is known as highway drainage. Highway drainage is an essential part of highway design and construction which remove the surplus water with in the highway limits and satisfactory dispose it. Road way drainage is mainly due to surface runoff from adjacent area, precipitation of rain and moisture rising by capillarity from the ground water table. Removal and diversion of surface water from road way and adjoining land is known as surface drainage. Removal of excess sub soil water from. the sub grade is termed as sub surface drainage.

Fig 7 . Side drain with precast slab

Requirements of Road Drainage System:

The Following are the requirements of good drainage system:-

- The road payment should have impervious top surface with sufficient camber. So that, the surface water drains off without percolate into the road pavement.
- The shoulders of road pavement should also have an impervious top surface with a proper cross slopes to drain off the water effectively towards a road sides.
- The side drains should have. sufficient capacity and longitudinal slope to carry away the collected water without overflow.
- Seepage & other sources of underground water, if any, should be tapped & the water should be drained off by sub-surface drains.

DIMENTIONS AND REINFORCEMENT DETAILS OF RCC DRAIN

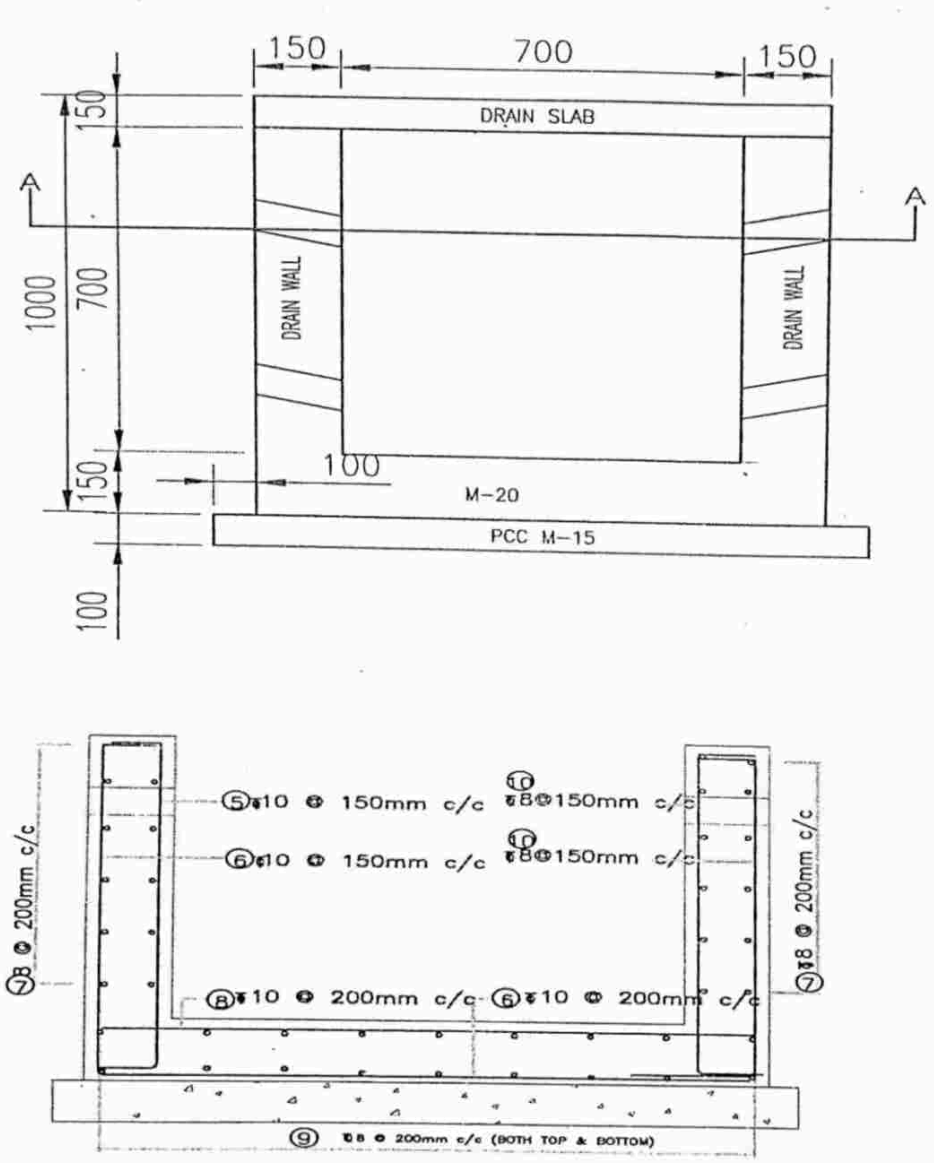


Fig 8. Typical section of Rcc drain

- **DRAIN DETAILS**

  Size of drain: outer dimension :-1m x 1m

  Dinner dimension:-0.7m x 0.7m

- **Reinforcement details:**

  Main reinforcement : Raft slab :-10mm dia @200mm c/c

  Side walls :- 10mm dia @150mm c/c

  Distribution reinforcement: 8mm dia @ 200mm c/c

- **Materials** :- Concrete : M25

  Steel. : FE500

Fig 9. Form work and reinforcement of rcc drain

Expansion Joints:-

It is a separation between two portions of the same structure is known as Expansion joints. As per IS- 456:2000, structures exceeding **45m** in length are designed with one or more expansion joint. As per IS 3414 which is a specific code for joints, it is mentioned as **30m.**

Width of Joint-20 to 25mm gap is sufficient to dissipate stresses due to thermal expansion. However during occurrence of earthquake, we need to ensure that the structures between the joints do not pound at each other.

* * * * *

3.2.3 Box Culvert:

Box culvert is culvert consisting of one or more numbers of rectangular or square openings, having their floor & top slabs constructed monolithically with abutments & piers is known as **Box Culverts.** Box culverts are made up of concrete and especially, RCC (Reinforced Concrete).

7.2 Layout of Construction of Culvert:

- The location and design of the culvert is based on the Qty of rainfall and runoff of a particular area obtained from the hydrological study and counter map.
- For establishing location of any bridge we are given centre line chainage of the given bridge.
- Dimension of all the components of bridge is decided by turning Auto level through various angles we can plot layout of our bridge.
- For providing better drainage slope of 1 in 100 is provided but slope is provided before construction of superstructure.

The Box culvert should perform following functions

The culvert with its appurtenant entrance and outlet structures should efficiently discharge water, bed load, and floating debris at all stages of flow.

Fig 10. Box culvert

1. It should be designed to accommodate increased runoff occasioned by anticipated land development.
2. The main function of the box culvert is to collect the water from drains and discharge it into the natural stream or nala.
3. Alignment should be such that water enters and exits the culvert directly. Any abrupt change in direction at either end will retard flow and cause ponding, erosion, or a build-up of debris at the culvert entrance. All of these conditions could lead to failure

Fig 11. Reinforcement of Box culvert

- **Box culvert details:**

  Size of Box culvert: 20m x1.4m x 1.4m of two

- **Reinforcement details:**

  Raft slab : Main reinforcement:-10mm dia @200 mm c/c
  Dist reinforcement :-10mm dia @250 mm c/c

  Substructure: Main reinforcement:-10mm dia @200 mm c/c
  Dist reinforcement :-10mm dia @250 mm c/c

  Top slab: Main reinforcement:-12mm dia @100 mm c/c
  Dist reinforcement :-10mm dia @200 mm c/c

  Haunch slab: 8mm dia @ 200mm c/c

- **Material properties:** Concrete :-M25
  Steel. :- FE500 (TMT)

Advantages of Box Culvert:

- The box culvert is a rigid frame structure and very simple in construction
- It is Suitable for non-perennial streams where scrub depth is not significant but the soil is weak.
- The bottom slab of the box culvert reduces pressure on the soil.
- Box culverts are economical due to their rigidity and monolithic action and separate foundations are not required.

3.2.4 RETAINING WALL:

A retaining wall is a structure designed and constructed to resist the lateral pressure of soil, when there is a desired change in ground elevation that exceeds the angle of repose of the soil. Retaining walls are used for supporting soil laterally so that it can be retained at different levels on the two sides. Retaining walls are structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope). They are used to bound soils between two different elevations often in areas of terrain possessing undesirable slopes or in areas where the landscape needs to be shaped severely and engineered for more specific purposes like hillside farming or roadway overpasses.

Fig 12 . Reinforcement of retaining

8.2 Reason For The Construction Of Retaining Wall:

The existing Cement factory road is at a elevation of RL 517.0M and main highway road is at a elevation of RL 521.0M to meet the two levels the road construction has to be carried out in embankment and at two sides of road the provision of service road of width

5.0M will be constructed .The retaining wall is constructed to take up the load of the road embankment and provide the support for main road to act as a barrier. There are three types of retaining walls will be constructed of different height increasing step by step to meet the required elevation.

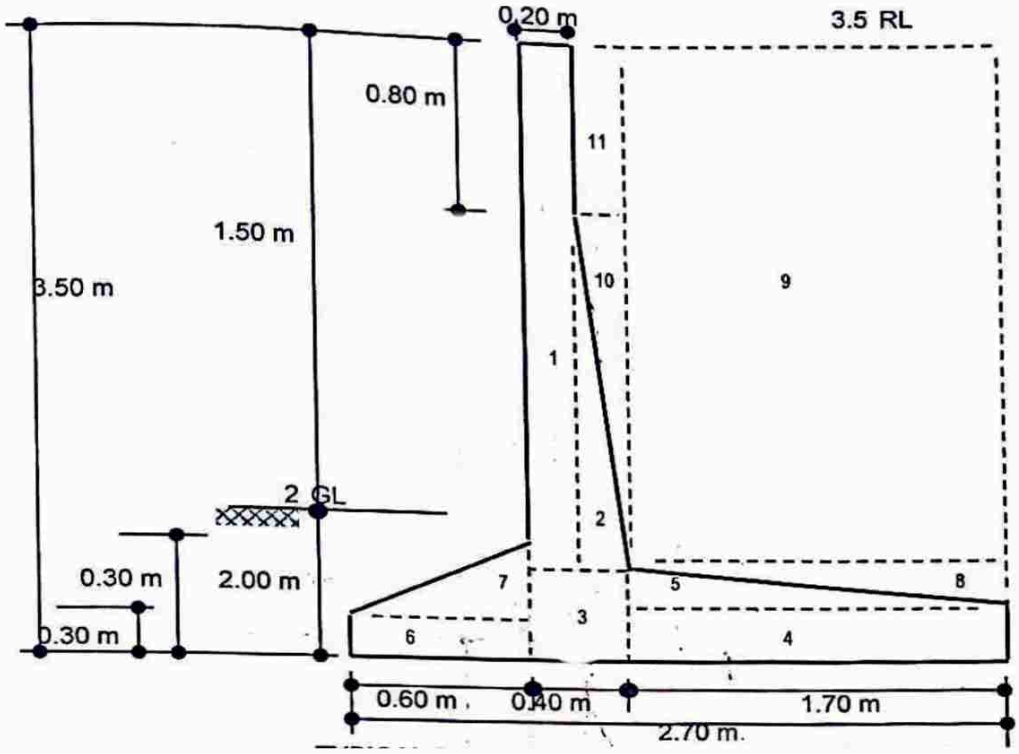


Fig 13. Dimension details of Retaining wall

- **Reinforcement details of retaining wall :**

Stem : Main reinforcement. :-16mm dia @150mm c/c

Distribution reinforcement :-10 mm dia @ 200mm c/c

Heel slab : Main reinforcement. :-10mm dia @200mm c/c

Distribution reinforcement :-10 mm dia @ 200mm c/c

Toe slab. : Main reinforcement. :-12mm dia @150mm c/c

Distribution reinforcement :-10 mm dia @ 200mm c/c

- **Material properties:** Concrete :- M30

Steel :- FE500 (TMT bar)

3.3 Issues or problems in execution:

There are various issues will arise site when the work is to be executed following are the some issues,

- The big problem in the road construction is rain and when the excavation work is carry outing the water will get logged in tranches.
- Vehicle moment at the time of laying of pavement.
- Protecting the materials from rain and proper site for the storage of materials.
- Improper coordination between labours and site engineer in the execution.
- Financial problems.
- Sometimes it is very difficult to prepare the moulds for concreting of structures as specified in drawing because of some difficult and irregular shape.
- Some times the ground strata will be very week for construction the we have to go for deep excavations until or unless we reach the hard strata.
- Electrical poles , transformers sand tress in the alignment of road.

3.4 Suggestions to solve the issues:

- Ensureing the proper communication between engineer ,contractor and labours.
- Pumping and removing the water from trenches before carry outing the construction activities.
- The contractor and labours should having the good relationship with the local people at site.
- Adequate supervision should be done by site engineer.
- Minimising the wastage of materials and punctuality in timing will reduce the cost of construction.
- Relocating the electrical pole from initial position to nearby location away from alignment with the permission guidence of Electrical board.

CHAPTER NO – 04

WATER TREATMENT PLANT BAGALKOT

4.1 INTRODUCTION:

WATER treatment is any process that improves the quality of water to make it more acceptable for a specific end-use. The end use may be drinking, industrial water supply, irrigation, river flow maintenance or many other uses. Water treatment removes contaminants and undesirable components, or reduces their concentration so that the water becomes fit for its desired end-use.

4.2 ABOUT THE TREATMENT PALNT:

A Jack well is constructed at Anadinni village located at a distance of about 1 km on upstream side of the Bannidinni Barrage across Ghataprabha River. The pumps are designed for 20 hours pumping and two number of 400 H.P vertical turbine pumps (one working and other one is standby) are installed in the Jack well. The raw water from the Ghataprabha river is being pumped and transported through 700 mm dia M.S. raising main over a distance of about 4.20 Km. to the Water Treatment Plant (WTP) at Gaddanakeri cross. One more pump house is constructed here also with installation of two number of 400 H.P.,Vertical turbine pumps (one working + one standby). The water after treatment is again pumped and transported through 700 mm dia MS raising main over a distance of 700 m to Ground Level Service Reservoir (GLSR) of 50 Lakh litres capacity located on Gaddanakeri Hillock at an elevation of RL 605.402 m. From this GLSR water is being supplied through gravity main and feeder mains to the various reservoirs located in the new and old Bagalkot Town. The CI & DI pipes of various diameters are provided for distribution net work in Unit-I.

The selection of the best combination of processes to treat water from a particular source depends on a number of factors. These factors include:

- the amount of suspended solids;
- the turbidity of the water;
- the nature of the suspended material;
- the chemical properties of the water (alkalinity and pH);
- the volume of water to be treated, and
- the availability of facilities, trained operators and supervisors.

4.3 BAGALKOT WATER TREATMENT PLANT PROCESS:-

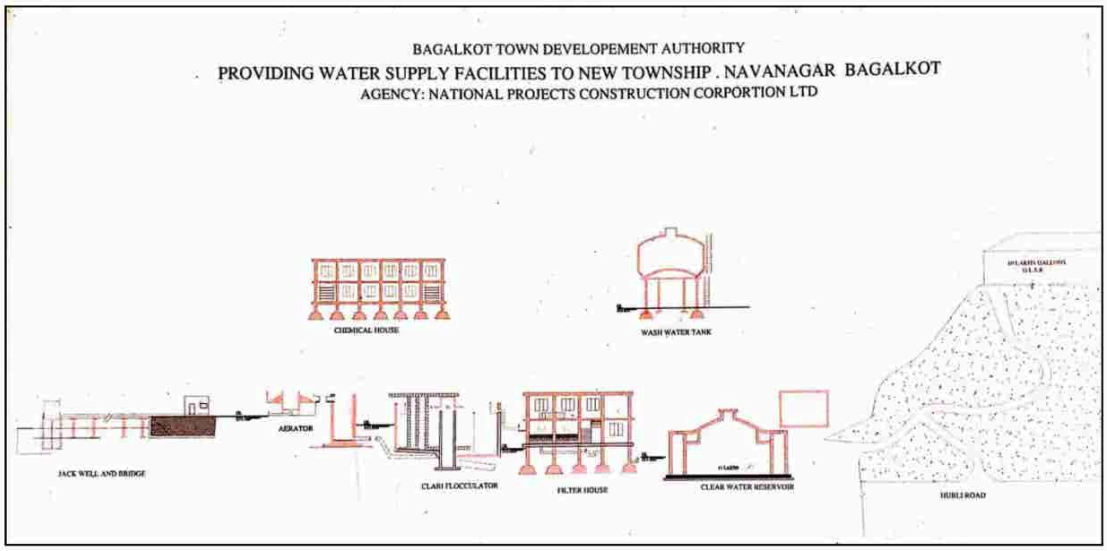


Fig 14 Steps involved in the Water treatment

1.SOURCE:

The water is drawn from the GHATAPRABHA River and process of screening is done to exclude floating matter in the pipes.

2.AERATION:

- It is the process of exposing the water to atmospheric air to eliminate gases such as carbon dioxide, hydrogen sulphide, and minerals such as iron and to increase the oxygen content.
- Aeration process is carried out in aerator.
- The water is drawn from the GHATAPRABHA River through 400HP motors by using jack well. And the diameter of the pipe is 700 mm.
- And the waste water is added here to recycle that which the water is used to clean the rapid sand filter bed.

Fig 15 .Aeration tank

Lab test and chemicals preparation

Before the treatment of raw water, the turbidity must be tested to check amount of suspended particles in water. After turbidity measuring, jar test take place in order to determine optimum required of coagulate and PH required for treating water. All chemicals are prepared and injected in water. After jar test, the optimum required coagulate is calibrated and inject in water to form floc in water treatment. The most coagulate usually used is aluminium sulphate (Al2 (SO4)3) called alum for flocculation. Then, polymer is also used to increase speed of flocculation.

3.FLASH MIXER:

It consists of rectangular tank provided with an impeller, by an electric motor. The impeller revolves at a speed of 100 to 120 rpm. In this process alum is added as coagulants. The quantity of alum is defends upon the turbidity test. Then the raw water is allowed to settle in sedimentation tank.

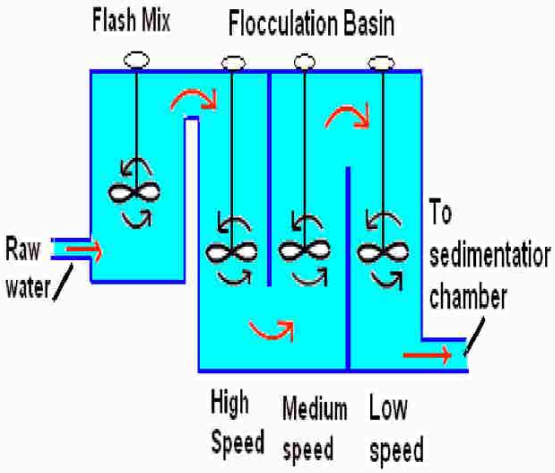


Fig 16. Flash mixer

4.SEDIMENTATION:

- After the process of flash mixers water flows to a tank called sedimentation. During sedimentation, floc settles to the bottom of the water supply, due to its weight. This settling process is called sedimentation.
- In sedimentation tanks 5,00,000 litre of water can be stored at a time.
- It would take a very long time for all particles to settle out on the sloping floor of the tank get removed by means of a scraper.
- The scraper moves continuously around the floor at a very low velocity not greater than 4.5 m/hour.
- So that the all settled particles which are at the bottom is kept out from the sludge outlet. And the top surface flowing water is sent to the filtration process where the smaller particles are removed.

Fig 17 .Sedimentation tank

5.FILTRATION

- It is the process of allowing the water to pass through the layers of sand called media which acts as a strainers.
- In water supply treatment of Bagalkot they use rapid sand filter (Gravity type) and it allows high rate of filtration of about 4000 to 6000 litres/square metre/20 minutes.
- It consists of a rectangular tank of size about 3X4m or of surface area 10 to 30m^2 and are provided with media of very hard sand and gravel of different grades in layer.
- Rapid sand filters clogs rather rapidly and cleaning is, therefore necessary at an intervals of 24 hours . It is accomplished by an arrangement of pipes. Water through

the wash water storage tank. Which allows a reversal flow of water through the filter called “back washing” of filter.

- Then the wash water is again sent to aeration chamber for recycling of water.

6.POST-CHLORINATION:

- After the water has been filtered, a disinfectant (for example, chlorine, chloramine) may be added in order to kill any remaining parasites, bacteria, and viruses, and to protect the water from germs when it is piped to homes and businesses.
- The process of treating the water by chlorine is called chlorine.
- Chlorine is generally available in gas, liquid or solid form but here chlorine is added in the gas form.
- Chlorine is added with the water at the rate of 0.10 to 0.20 ppm per litres for the small flow of water and the solution fed into the filtered storage tank.

Fig 18. Mixing of chlorine with water

Fig 19.cylinders of chlorine gas of 900kgs capacity

7.STORAGE AND PUMPING:

- The filtered water is transferred to storage tank by using 400HP pumps.
- Actually there are two pumps are available one of them is for regular use. And other one is used by diesel generators when electricity is not available to pump the water.
- Working duration of pump is 12 to 14 hours
- The storage tank is constructed on the hill so the distribution of water is carried out by gravity.
- Storage tank size is 54mX15mX7m.
- Storage tank consists of two chambers, in each chamber 25,00,000 litres of water can be stored.

Fig 20. 400 HP PUMPS

STORAGE TANK

4.4 SOME OF THE TESTS ARE CONDECTED ON WATER IN THE TREATMENT PLANT

Namely as follows;

1. TDS meter
2. PH meter
3. Turbidity
4. Alum jar Test

4.5 WATER QUALITY PARAMETERS AND DRINKING WATER STANDARDS

SL.NO.	PARAMETERS	UNITS	DRINKING WATER IS: 10500 – 1991	
			DESIRABLE	MAXMUM
1	Colour	Hazen units	5	25
2	Odour	-	Unobjectionable	-
3	Taste	-	Agreeable	-
4	Turbidity	NTIJ	5	10
5	pH value		6.5 to 8.5	No relaxation
6	Total hardness (as $caco_3$)	mg/l	300	600
7	Iron		0.3	1
8	Chlorides	mg/l	250	1000
9	Residual, free chloride	mg/l	0.2	-
10	Dissolved Solids	mg/l	500	2000
11	Calcium	mg/l	75	200
12	Copper	mg/l	0.05	1.5
13	Manganese	-	0.1	0.3
14	Sulphate	-	200	400
15	Nitrate	mg/l	50	No relaxation
16	Fluoride		1	1.5

CHAPTER NO – 5

SITE VISIT PHOTOGRAPHS

Fig 21. Crematorium Site Visit at sector no 56

Fig 22. Road work Explanation by Mr.Suresh Teggi Sir at kerudi hospital

Fig 23.Optical fiber base explanation at sector no 86 by Mr. V.K.Chitavadagi sir

Fig 24. Excavation work of Box Culvert at Bagalkot Cement Factory Road

Fig 25. Formwork of Side Drain at Unit – 2 (Sector No 112)

Fig 26. Reinforcement work of drain explanation by Mr.Basavaraj Malagi sir at Sector No. 112

Fig 27. Water Tank Capacity of 5 Million Litres

Fig 28. Clariflocculator explanation at BTDA water treatment plant by Mr.Mukupi sir

Fig 29. Water testing Laboratory

Fig 30. Slab Reinforcement explanation of Server Hub at Unit – II by Mr.V.K.Chitavadagi sir

Fig 31.Curing of Box Culvert at Basaveshwer PU college cross

Fig 32. Box culvert construction explanation by Mr. Asif Makandar

5.2 CONCLUSION

We can conclude that there is difference between the theoretical and practical work done. As the scope of understanding will be much more when practical work is done. As we get more knowledge in such a situation where we have great experience doing the practical work.

Being at under graduate level we have tried our best to make this internship the success. This internship has given an opportunity to recollect and re-coordinate and also good exposure to the various works like site works, quality evaluation, estimation, steel calculation etc. and engineering principles which have been covered in previous courses and open ended experiments. The various operations of the building have been analysed perfectly and the Indian codes have been followed.

TECHNICAL SKILLS DEVELOPED:-

The foremost basic knowledge in site work is the quality, quantity, safety and time management. From this internship we got an opportunity to develop all these things. The internship helped to develop following Technical Skills:

1. Ability to read and understand complex drawings.
2. Ability to understand and apply complex technical specifications, standards, and procedures.
3. Ability to perform simple mathematics and solve engineering problems.
4. Knowledge of basic concrete construction.

NON-TECHNICAL SKILLS DEVELOPED:-

Non-technical things that help us nurture our self for a better future include time management, good communication and appropriate solutions for different problems in review this internship has been an excellent and rewarding experience. We have been able to meet and network with so many people that we are sure will be able to help us with opportunities in the future. One main thing that we have learned through this internship is time management skills as well as self- motivation.

The entire period proved to be a good source of practical exposure. At the end of the internship now we feel our self quite equipped to face the problems in field of construction and office.

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Sri BVV Sangha's

Basaveshwar Engineering College, (Autonomous) Bagalkot-587102

(Government Aided Institution and permanently affiliated to Visvesvaraya Technological University, Belagavi & accredited by NAAC with 'A' grade from 2017-2022)

Attendance of the students during Internship
6TH Semester (UG)

Company/Authority/Department/Internship Firm Name :Bagalkot Town Development Authority

Name of the Student: Pramod Padaki

USN No: 2BA19CV418

Week 1	Date	Signature of the student	Signature of the staff in charge	Remarks
Day 1	01-09-2021	P.B. Padaki		
Day 2	02-09-2021	P.B. Padaki		
Day 3	03-09-2021	P. B. Padaki		
Day 4	04-09-2021	P.B. Padaki		
Day 5	06-09-2021	P.B. Padaki		
Day 6	07-09-2021	P.B. Padaki		
Week 2				
Day 1	08-09-2021	P.B. Padaki		
Day 2	09-09-2021	P.B. Padaki		
Day 3	10-09-2021		HOLIDAY	
Day 4	11-09-2021	P.B. Padaki		
Day 5	13-09-2021	P.B. Padaki		
Day 6	14-09-2021	P. B. Padaki		
Week 3				
Day 1	15-09-2021	P. B. Padaki		
Day 2	16-09-2021	P. B. Padaki		
Day 3	17-09-2021	P. B. Padaki		
Day 4	18-09-2021	P. B. Padaki		
Day 5	20-09-2021	P. B. Padaki		
Day 6	21-09-2021	P. B. Padaki		
Week 4				
Day 1	22-09-2021	P. B. Padaki		
Day 2	23-09-2021	P. B. Padaki		
Day 3	24-09-2021	P. B. Padaki		
Day 4	25-09-2021	P. B. Padaki		
Day 5	27-09-2021	P. B. Padaki		
Day 6	28-09-2021	P. B. Padaki		

ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು,
ಬಾಗಲಕೋಟೆ ಪಟ್ಟಣ ಅಭಿವೃದ್ಧಿ ಪ್ರಾಧಿಕಾರ
ಬಿ ವಿಭಾಗ ನಂ. 1 ಬಾಗಲಕೋಟೆ.

ಕಾರ್ಯನಿರ್ವಾಹಕ ಇಂಜಿನೀಯರರು,
ಬಾ. ಪ. ಅ. ಪ್ರಾ. ವಿಭಾಗ ನಂ-2,
ಬಾಗಲಕೋಟೆ

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BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),

BAGALKOT-587 102

(Government Aided Institution and permanently affiliated to Vishveshvaraya Technological University, Belagavi.Accredited by NAAC with 'A' grade from 2017-2022)

DEPARTMENT OF CIVIL ENGINEERING

INTERNSHIP TRAINING REPORT

Submitted in partial fulfilment of requirements for the award of the degree

BACHELOR OF ENGINEERING

In

CIVIL ENGINEERING

2021-2022

Name of the Authority

BAGALKOT TOWN DEVELOPMENT AUTHORITY

Internship Authority/Firm Name

Mr.Manmathayya.M.Swamy

Chief Engineer, BTDA Bagalkot

Internship Co-ordinator.	Head of Department
Prof. G.H.Bandihal	Dr. P.G.Rakaraddi

Submitted by

NAME	USN
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BAGALKOT-587 102

(Government Aided Institution and permanently affiliated to Vishveshvaraya Technological University, Belagavi accredited by NAAC with 'A' grade from 2017-2022)

CERTIFICATE

This is to certify that the conducted "INDUSTRY INTERNSHIP TRAINING REPORT" is a bonafide work carried out by MR.SAIPRAKASHA bearing USN:2BA19CV424 in a partial fulfilment of the requirements for the award of Bachelor of Engineering degree in the Civil Engineering of BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS) BAGALKOT during the year 2020-2021. The report has been approved as it satisfies the academic requirements in respect of INTERNSHIP TRAINING prescribed for the said degree.

Under the Guidance of	Internship co-coordinator	Head of department
Mr.Manmathayya.M.Swamy Chief Engineer	Prof.G.H.Bandihal	Dr. P.G.Rakaraddi

Name of Examiners	Signature of the Examiners
1._____	1._____
2._____	2._____
3._____	3._____

BAGALKOT TOWN DEVELOPMENT AUTHORITY, BAGALKOT.

No:CE/BTDA/PB-1/2016-17/

Office of the Chief Engineer,
Bagalkot Town Development Authority
Bagalkot.

Date: **18-10-2021**

CERTIFICATE

Date **18-10-2021**

This is to certify that **Mr.Saiprakasha Rathod** bearing USN **2BA19CV424** has undergone Industrial training at our organization from **01-09-2021 to 28-09-2021**

The Trainee was found to be regular, punctual and attentive during the period of training at our organization.

Chief Engineer,
B.T.D.A.,Bagalkot.

ACKNOWLEDGEMENT

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In all sincerity,

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ABSTRACT

A. NEED OR AIM OF THE INTERNSHIP

The aim of this internship is to permit the students to practice theoretical or academic knowledge required during four years of engg and to familiarize to professional realities. To provide the student an opportunity to apply knowledge, skills and experiences gained during the academic program to a professional setting.

The specific objectives are:-

- To apply theory in a practical environment.
- To establish groundwork and provide networking for professional development and growth in a career.
- To further help students recognize their own strengths and weaknesses both personally and professionally.
- To facilitate students as they assess personal ambitions in their chosen field.
- To prepare students for employment or graduate education.

B. ABOUT BAGALKOT TOWN DEVELOPMENT AUTHORITY

Bagalkot is one of the major town in north Karnataka State, which is affected in phase II and please III of stage of Upper Krishna Project. Bagalkot town will be submerged under back water of Almatti reservoir at different elevations. Different portions of Bagalkot town will be affected gradually as the storage level of Almatti dam increases.

Resettlement plan consists of acquisition of land for locating the new Bagalkot town and making all arrangements to provide basic infrastructure in the new township. For this purpose the state government has been enacted a special legislation called 'BAGALKOT TOWN DEVELOPMENT ACT 1993'. The act provides for establishment of separate autonomous authority to plan, develop and manage the resettlement and rehabilitation of PDF's of the old Bagalkot town as well as to create a modern township. The authority is headed by a non-official Chairman and it also provides membership for non-official representatives. A Chief Engineer designed as its Chief Executive. The board of the B.T.D.A. also has secretaries to the Government (of all relevant departments) as its members. So far BTDA has mainly dealt with resettlement and rehabilitation of PDF's. Funds has been provided for this project by the government up to 1995 and afterwards the KBJNL Bangalore has been funding.

C. ABOUT THE WORK FIELD:

The project stretch starts at Kerudi cancer hospital and Cement factory circle to Raichur - Bachi road, Bagalkot. The total considered length for improvements is 1.58km. The project stretches pass through Plain/Rolling Terrain. Some private layouts with prominent structures like Hospitals, Commercial complex and medical collage have come up all along this road. This is are main interlinking roads from Navanagar Unit-1, Unit-III (to be developed) to old Bagalkot, Cement Factory, Medical College, APMC and existing Raichur – Bachi road. I have visited the another site which is at Basaveshwar PU college it is the one of the main road connecting to Vidyagiri and the total stretch was 625 m work started from Raichur highway cross to college circle.

D. TASKS PERFORMED DURING THE INTERNSHIP:

Whereas Road construction activities were carried out at site they are,

1. Marking out the levels of road crust ,levels of drain,Box culvert.
2. Centerline marking of Rcc drain.
3. Construction of road embankment.
4. Formwork for Rcc drain.
5. Reinforcement and bar bending of Rcc drain and Box culvert.
6. Checking out the measurements of work done in the site according to the specifications and estimation and looking at the Construction steps and being explained the site engineer.
7. We learn the process of construction by looking at various process like laying of form work,concreting of the slab and drains and Reinforcement.
8. Also learn the various materials used for Construction and how much quantity of the materials required for the construction work.

E. OUTCOMES:

1. Management of the labours and the Construction materials at site.
2. Management of cost at site and making it most economical as much as possible.
3. Identify the specific design, process and decision to reduce or eliminate the potential for failure.
4. Learn from the others experience to avoid the pitfalls and minimizing the repetition of errors in work.

CHAPTER – 01

INTRODUCTION

1.1 TECHNICAL REASON FOR SELECTION OF THE PARTICULAR FIELD:

The aim of this internship is to permit students to practice theoretical or academic knowledge required during four years of student and to familiarize to professional realities. To get an opportunity to apply knowledge, skills and experiences gained during the academic program to a professional setting. I choose Bagalkot Town Development Authority (BTDA) a Government body. For this internship training for a close observation of work related to Civil Engineering and application of my academic knowledge in practical field. In this internship, I have focused on my main target that was to get a complete overview of Public construction works (Civil) under Bagalkot Town Development Authority.

1.2 BASIC TERMS OF THE FIELD:

1. **SCHEDULE OF RATES:** A schedule of rates is a list in a contract setting out the staff, labour and plant hire rates etc that a contractor will use for pricing cost reimbursable work.
2. **EMBANKMENT**: An embankment refers to a volume of earthen material that is placed and compacted for the purpose of raising the grade of a roadway (or railway) above the level of the existing surrounding ground surface.
3. **BIM: BIM (building information modelling)** is the process of creating a computer model of a building that includes all of the details of that structure, from its basic layout to the smallest measurements.
4. **BOQ:** The bill of quantities is a contract document that contains a list of materials and workmanship involved in a construction project. It is necessary for properly pricing a project.
5. **Field measure:** Taking measurements within the structure itself rather than relying on blueprints.
6. **Reinforced concrete:** Concrete that is strengthened by adding steel bars or mesh within the concrete.
7. **Blueprints:** A 2-dimensional technical drawing that has all of the project's details.
8. **Design-Bid-Build:** A traditional project delivery method where the owner or agency contracts separate firms to design and construct the building.

9. **Public-Private-Partnership:** A project delivery method where a government agency and a private sector company collaborate to fund, build and maintain construction projects as the private generates income from the project.
10. **Target Value Design:** This design method involves all key stakeholders — including the owner, subcontractors, designers and contractors — who will design the construction project to meet the owner's goals and budget.
11. **Foreman**: The leading supervisor at the construction site who is in charge of the work crews. He ensures workers perform daily tasks based on established schedules while creating documents regarding completed work.

1.3 BRIEF DESCRIPTION OF THE TECHNOLOGY OR WORK:

- **Reconnaissance Survey:**

The consultants made an in-depth study of the available land width (ROW), topographic survey maps of the project area and other relevant information were collected. A detailed reconnaissance survey was conducted on the total project area and an assessment of possible alignment change at places, if required, was also made. Detailed features such as land-use, habitation, water routes, utilities such as electrical lines (HT/LT), etc. were also noted down.

- **Topographical Survey:**

Topographic survey using total station equipment was conducted and a contour map shall be prepared showing contour line drawn at an interval of 0.5m, it also indicate all the prominent existing features such as roads, railway tracks, colonies, (independent houses also), power lines, water bodies, farms, gardens, fields etc. Few reference stones were marked on the survey map and their levels were enlisted (smaller to larger scales). Providing and fixing of boundary stones at an interval of 50m and additionally wherever bends occurs was done as per the directions of Engineer In charge. project influence area was utilized for planning and programming the detailed surveys and investigations.

- **Block Level Survey:**

Block level survey was taken up and a contour map was prepared showing contours at intervals of 0.5m. The RL was indicated based on either an established TBM, if available, or with reference to a TBM established.

- **Office Processing:**The field survey will be processed in the office to provide a digital output file for the design engineers.

The Surveyor will arrange for a proof survey for a statistical sample to check the digital maps in the field.

The data will be structured so that the vertical profile of the proposed alignment can be produced automatically. The format of the resulting data will be such as will readily promote the calculations of earthworks and other quantities required for the evaluation of detailed cost estimates.

- **Test Pit Investigation :**

Test pit investigation survey of the road sections spread over the entire road section has been carried out. At each location, large test pits of 1.0 mx 1.0 m were dug at pavement-shoulder (pavement edge) interface up to sub grade level in a staggered manner along the existing road alignment to assess the pavement details (such as layer type, thickness and material). In-situ tests to determine field density such as Core cutter test or sand replacement test depending upon the soil type also has been done. Subgrade soil samples have been collected and tested in the field/ laboratory for assessing its strength characteristics such as, field moisture content,in-situ density test, grain size analysis and CBR test on 4-day soaked samples.

- **CBR Value**:

The California Bearing Ratio (CBR) is a measure of the strength of the subgrade of a road or other paved area, and of the materials used in its construction.The ratio is measured using a standardized penetration test first developed by the California Division of Highways for highway engineering.[1] Empirical tests measure the strength of the material and are not a true representation of the resilient modulus

- **Road Side Drainage:**

An effective drainage system shall be planned for the drainage of roadway as per stipulations of IRC SP: 42-1994 for maintaining structural soundness and functionality of the project road.

- **Pavement Design:**

The design is based primarily on IRC Guidelines. For the design of the overlays for the existing lane pavement, the strengthening work takes due considerations of the strength of the existing pavement. The overlay thickness has been worked out for road segment in relation to condition, strength and sub-grade characteristics.

1.4 STUDY AREA DESCRIPTION,SPECIALITY AND LOCATION(MAP):

Map location: Kerudi cancer hospital to cement factory circle.

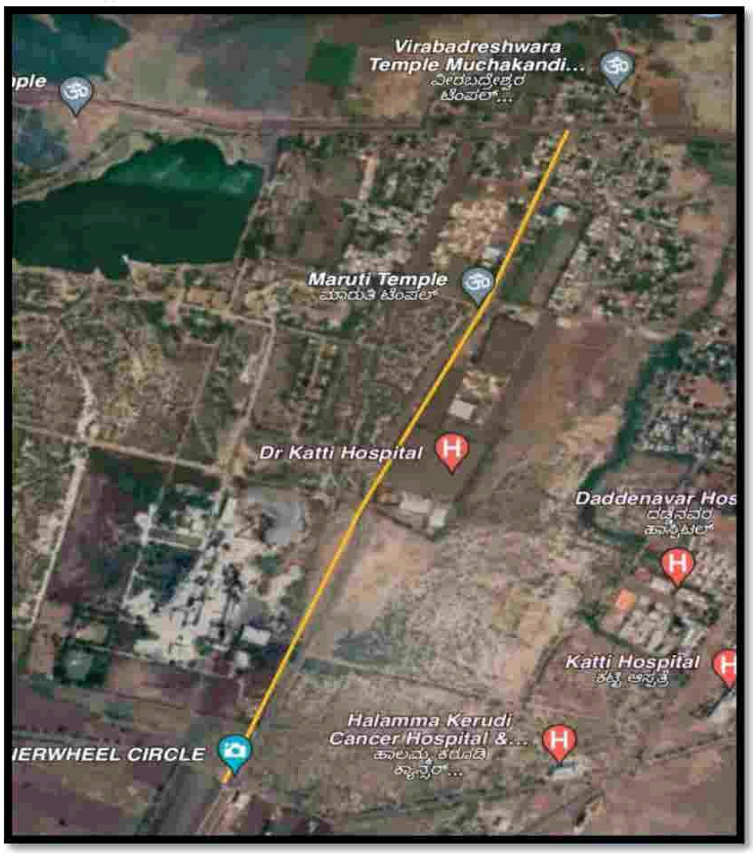
Work Speciality: Construction of 4 lane road and cross drainage work.

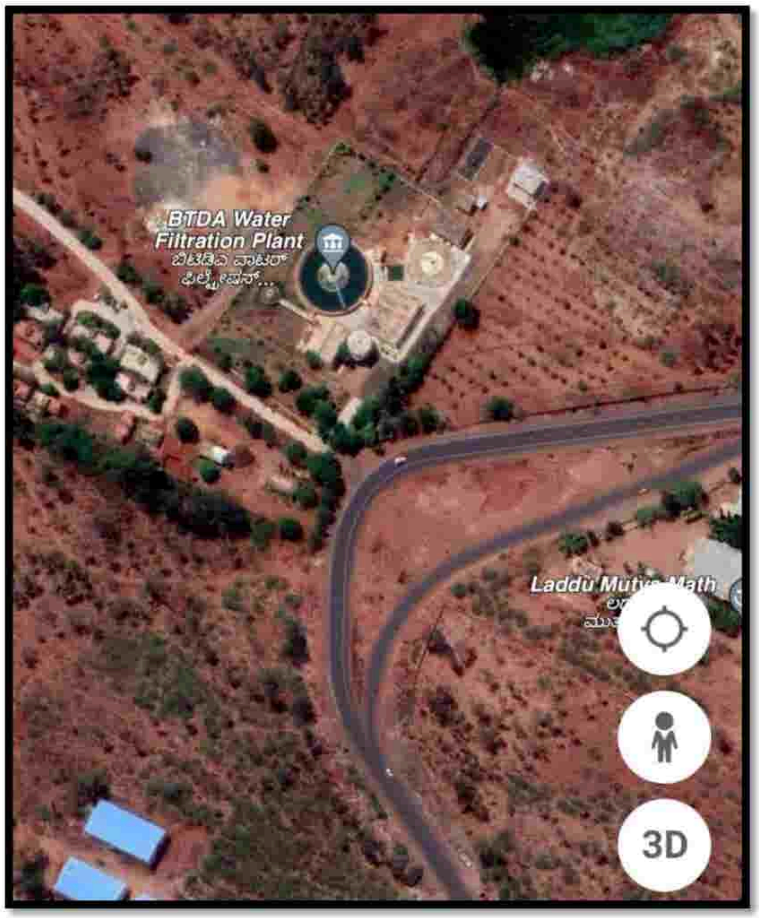
Study area discription: The road was 800m and construction of GSB and WMM layer and Curing of box culvert.

Map location: Muchakandi cross to cement factory.

Work Speciality: Construction of 4 lane road and cross drainage work and Retaining wall.

Study area discription: The road was 1800m and construction of Sub grade,GSB and WMM layer and excavation for box culvert.





Map location: BTDA Water treatment plant.

Work Speciality: Treatment of raw water different steps and pumping to the GSLR.

Study area discription: Plant receives the water from Krishna back water Ghataphraba river through Jack well and daily treat the water of QTY 17.5 MLD Litter.capacity of treatment plant is about 27 MLD

Map location: Basaveshwar PU college to NH-367 Raichur Highway.

Work Speciality: Construction of 4 lane road,Retaining wall and cross drainage work.

Study area discription: The road was 625m.Excavation for road and construction of WMM layer and construction of side walls and slab of box culvert.

1.5 WEEKLY PROGRESS IN THE FIELD OF CONSTRUCTION:

WEEK 1

- In the 1st week of internship I have visited to the site at near kerudi cancer hospital where I observe the construction process of road and cross drainage work.
- I have learned the Construction of GSB layer, WMM layer and also the requirements of Box culverts and locationing of culverts.
- I have also visited to the site near Railway station where the DBM and Pavement work is carried out.

WEEK 2

- In the second week of Internship I have visited to the site at near MUCHAKHANDI cross where excavation for Retaining wall is going and extinction of two lane road construction was going .
- In the site the site engineer has explained about the taking of levels of the road crust, side drain.
- Checked the measurements and levels of the construction work done according to the specifications and estimation.

WEEK 3

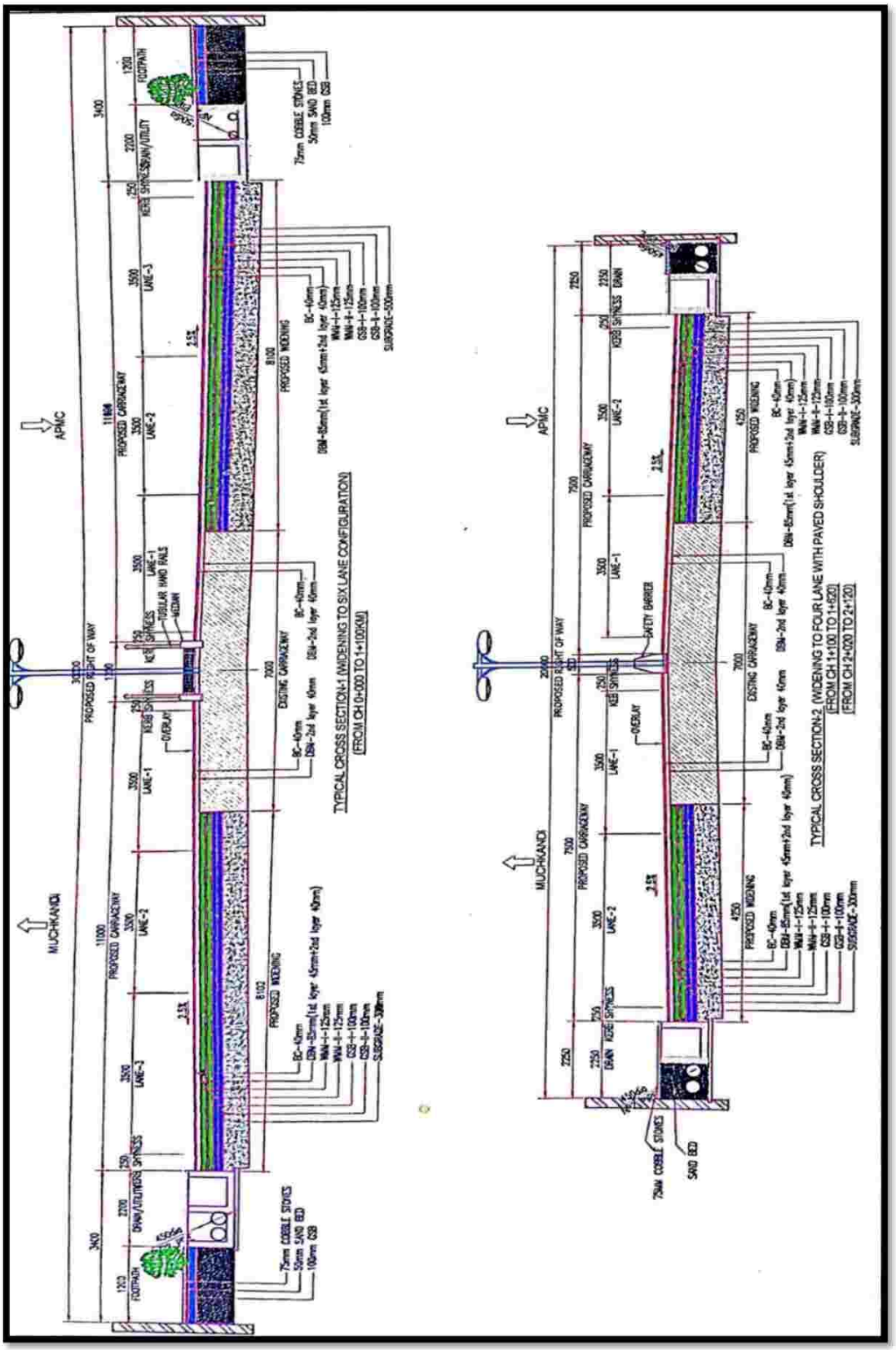
- In the 3rd week of internship I have visited to the BTDA Water treatment plant near Gaddankeri.
- In the water treatment plant I have seen the different steps involved in the treatment of raw water and quantity of dosage of different chemicals added to water.
- I have also visited to the site where construction of Rcc drain work is carry outing and learn about the reinforcement of drain and form work involved.

WEEK 4

- In the 4th week of internship I have visited to the site near police palace where the embankment construction of road work is carry outing
- I have visited to the sector no112 where the laying of optical fiber base cables going for the purpose of internet connection.
- I have also visited to the site near Basaveshwar PU college where the construction of road work and reinforcement of retaining wall work is going.

CHAPTER – 02

TYPICAL CROSS SECTION AND CREST DETAILS



2.1 GENERAL:

The proposed improvement is to be carried out to make it a good infrastructure for improvement of industrial configuration in all respects. The terrain on this stretch is rolling. This section describes the standards and principles based on which various designs will be carried out. These proposed standards are consistent with the parameters recommended in the relevant standards of the Indian Roads Congress (IRC). The aim of this chapter is to evolve design standards and material specifications for the study, which is primarily based on IRC publications and MoRT&H circulars and relevant standards.

2.2 Design Principles:

a) Designs-(Methodology):- The design Methodology as per IRC has been followed.
b) Traffic survey and growth:-Traffic survey for 7 days has been conducted. The growth rate of 5% has been considered as per IRC 37-2012.
c) CBR details and methods proposed for improving the CBR:- Based on the existing
d) CBR of the subgrade the crust has been designed
e) Crust Designs:-The Crust has been designed based on projected intensity of traffic and CBR, as per IRC 37-2012
f) Design of circles:-The design of circle has been done as per IRC Special Publication - 41 reprinted in 2012.
g) The design Period has been considered as 20years, The Construction period has been considered as 3years accordingly the traffic has been projected.

2.3 CROSS SECTIONAL ELEMENTS OF A ROAD

The characteristics of cross-sectional elements are important in highway geometric design because they influence the safety and comfort. The 6 basic cross sectional elements of a highway pavement are

1. Camber
2. Width of Carriage way
3. Road Margin
4. Width of Formation
5. Right of Way (ROW)
6. Median

1.CAMBER:

Camber or cant is the cross slope provided to raise middle of the road surface in the transverse direction to drain off rain water from road surface.

Too steep slope is undesirable for it will erode the surface. Camber is measured in *1 in n* or *n%* (Eg. 1 in 50 or 2%) and the value depends on the type of pavement surface. **The proposed road is provided with the slope about 2.5 % of total width of road.**

2.WIDTH OF CARRIAGE WAY:

Width of the carriage way or the width of the pavement depends on the width of the traffic lane and number of lanes. Width of a traffic lane depends on the width of the vehicle and the clearance. clearance improves operating speed and safety.The maximum permissible width of a vehicle is **2.44** and the desirable side clearance for single lane traffic is 0.68 m. This require minimum of lane width of 3.75 m for a single lane road.**The proposed width of Carriage way with two lane road is about 7.50 m and width of carriage way with three lane section is 11.0m.**

3.KERBS:

Kerbs indicate the boundary between the carriage way and the shoulder or islands or footpaths. **The proposed road is provided with kerb sharpness of 0.25m**

4.ROAD MARGINS:

The portion of the road beyond the carriageway and on the roadway can be generally called road margin. Various elements that form the road margins are given below.

A. **Foot Path:** A footpath (also pedestrian way, walking trail, nature trail) is a type of thoroughfare that is intended for use only by pedestrians and not other forms of traffic such as motorized vehicles, cycles, and horses.**1.2m wide Foot paths are provided in proposed cross section.**

5.WIDTH OF FORMATION:

Width of formation or roadway width is the sum of the widths of pavements or carriage way including separators and shoulders. This does not include the extra land in formation/cutting. **The total width of formation provided is about 30.0m.**

6.RIGHTOFWAY(ROW):

Right of way (ROW) or land width is the width of land acquired for the road, along its alignment. It should be adequate to accommodate all the cross-sectional elements of the highway and may reasonably provide for future development. To prevent ribbon development along highways, control lines and building lines may be provided. Control line is a line which represents the nearest limits of future uncontrolled building activity in relation to a road. Building line represents a line on either side of the road, between which and the road no building activity is permitted at all.

The importance of reserved land is emphasized by the following. Extra width of land is available for the construction of roadside facilities.

7.MEDIAN:

The median strip or central reservation is the reserved area that separates opposing lanes of traffic on divided roadways, such as divided highways, dual carriageways, freeways, and motorways. The term also applies to divided roadways other than highways, such as some major streets in urban or suburban areas.**The proposed road cross section provided with a median of width of 1.2m and provided with street lights at a interval of 30.0m**

3.4 CRUST DETAILS OF FLEXIBLE PAVEMENT:

Overlay for Road is designed taking into consideration of CBR value. For Paved shoulders. Earthwork for cutting by mechanical means is provisioned. Prior to earthwork in embankment, compaction of original ground with power roller is considered. For earthwork in embankment soil and earth for subgrade is proposed from borrow pits inclusive of median and shoulders.

Road Pavement Crust is composed of the following components:

1) Surface/Wearing Course
2) Base Course
3) Sub Base
4) Sub Grade

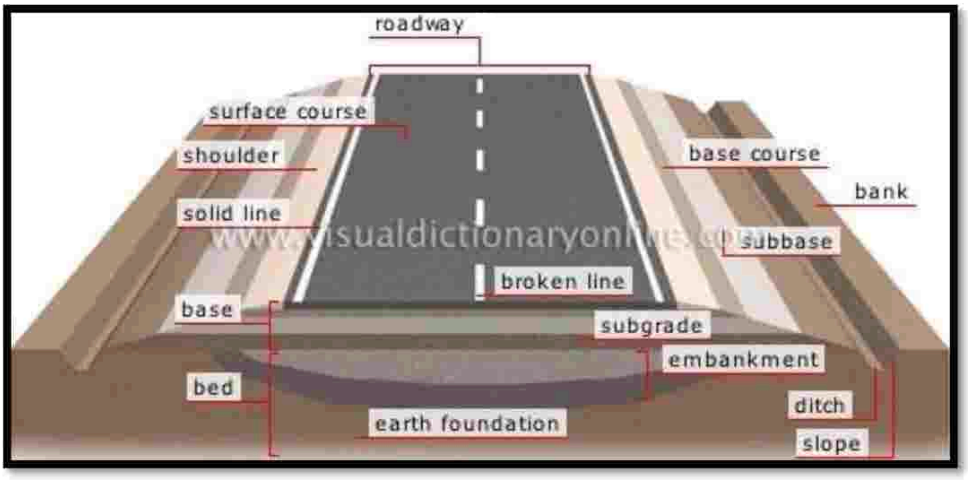


Fig 2. Crest of Flexible pavement

1. Surface/Wearing Course in pavement cross section:

The top layers of pavement which is in direct contact with the wheel of the vehicle. Usually constructed of material in which bitumen is used as binder materials.

a. Bituminous Pavement:

Consists of combination of mineral aggregate with bituminous binder ranging from inexpensive surface treatment ¼ in or less thick to asphaltic concrete. For good service throughout the full life bituminous pavement must retain following qualities.

- Freedom from cracking or raveling.
- Resistance to weather including the effect of surface water heat and cold.
- Resistance to internal moisture, particularly to water vapors.
- Tight impermeable surface or porous surface (if either is needed for contained stability of underlying base or subgrade).
- Smooth riding and non skidding surface.

2. Base course

It is the layer immediately under the wearing surface (Applies whether the wearing surface is bituminous or cement concrete and or more inch thick or is but a thin bituminous layer). As base course lies close under the pavement surface it is subjected to severe loading. The material in a base course must be of extremely high quality and its construction must be done carefully.

Types of Base Course

1. Granular Base Course
2. Macadam Base
3. In-water bound Macadam

4. Treated Bases

3. Sub Base:

It is layer of granular material provided above subgrade generally natural gravel. It is usually not provided on subgrade of good quality. It is also called granular subbase.

a. Function of Sub base in Road Cross Section

- It enables traffic stresses to be reduced to acceptable levels in sub-grade in the Road Cross Section so that excessive deformation is prevented.
- It acts as a working plate form for the construction of upper pavement layers.
- Acts as a drainage layer, by protecting the sub grade from wetting up.
- It intercept upward movement of water by capillary action.
- It acts as a separating layer b/w subgrade and road base. By this it prevent the two layers from mixing up.

b. Characteristics of materials used in Sub Base:

The subgrade material should be clean and free from organic matter and should be able to be compacted by roller, to form stable sub-base. The material should have following characteristic.

- Well graded uniformity coefficient (D60/D10) should not be less than 3.
- Fraction passing sieve #200 shall not be greater than 2/3rd of the fraction passing sieve #40.
- Should have a L.L not greater than 25%.
- P.I not greater than 6
- CBR should not be less than 25
- In coarse grain, aggregate retained by #10 sieve, %age of wear shall not be greater than 5%.
- The max dia of any particle shall not be greater than 2/3ed of the layer thickness of sub-base.

4.Sub Grade:

Consists of the naturally occurring material on which the road is built, or the imported fill material used to create an embankment on which the road pavement is constructed. Subgrades are also considered layers in the pavement design, with their thickness assumed to be infinite and their material characteristics assumed to be unchanged or unmodified. Prepared subgrade is typically the top 12 inches of subgrade.

Formation level defined as the final level of soil surface after completion of earthworks and when trough the process of compaction, stabilization and reinforced The subgrade's main function as to withstand the loading of road pavement (sub base, base, etc.) above it.

A) Road Crust details:

i) Existing Road Crust

WBM (Water Bond Macadam)	=150MM
BT (Bituminous Tar)	=75MM
Total.	**=225MM**

ii) Proposed Road Crust

GSB (Granular Sub Base).	=200MM
WMM (Wet Mix Macadam).	=250MM
DBM (Dence Bituminous Macadam).	=85MM
BC (Bituminous Concrete)	=40MM
Total.	**=525MM**

CHAPTER NO-3

MATERIALS, DIFFERENT CONSTRUCTION ACTIVITIES AND METHODOLOGY

3.1 Materials:

Soils and materials investigation for a road project is an essential requirement for design and construction. During design stage of the road pavement, embankment and other structures, the existing soils and materials inventory is needed for their characteristics, availability of required quality and sufficient quantity for construction at reasonable cost.

The project will require different type of construction materials, which include:

- Soil for embankment, subgrade and shoulder
- Granular materials for sub-base, drainage layer and backfill
- Stone aggregate and sand for pavement courses and cement concrete works
- Water for use in construction specially in case of cement concrete

The Consultants have collected information on the availability and suitability of the above Material from existing sources. The approved aggregate quarry is near. Further the prevailing market rates of construction materials such as sand, aggregates, murrum, cement and steel were gathered through enquires in Bangalore. Their quality, source and associated leads were also gathered..

3.2 WORKS ASSIGNED:

3.2.1Construction methodology for flexible pavement:

1) CLEANING AND GRUBBING:

Procedure:

The work shall commence soon after mobilization at the site has been completed to the extent that this activity can be taken up. Clearing and grabbing shall be carried out using bulldozers to generally scrap off the top crest of the formation bed with the main aim to clear the proposed road corridor of major bushes, unwanted waste materials and vegetation and roots so as to enable field survey works to be carried out up to reasonable precision and

accuracy besides conducting soil sampling and ad testing, visual or laboratory, on the existing ground materials to enable decision on further course of action on mode of road construction.

1. Dozer
2. Excavators
3. Tippers

2) EARTHWORK IN EXCAVATION:

Procedure:

1. Before the earthwork is started the whole area where the work is to be done should be cleared of grass roots of trees and unwanted debris.
2. Excavation should be carried out exactly in accordance with the dimension shown on the drawings or any other dimension, as decided by the Ste-in-Charge.
3. Sides of the trenches shall be I be vertical and its bottom shall be perfectly levelled. both longitudinally and transversely.Where the soil is soft, lose or slushy, the touch shall be widened for allowing steps on either side or the sides sloped or shored up.
4. During excavation if nocks or rocky soils are found, they shall be levelled as far as possible and the small spaces which are difficult to level shall be filled in with
5. If the excavation is in earth, the bottom of the trenches shall be sprinkled with a little water and rammed.
6. No material excavated from the foundation trenches shall be placed nearer than one meter to the outer edges of the excavation.
7. Water in trenches must be hailed or pumped out and where it is apprehended that sides may fall down or cave in, arrangement shall be made for adequate timber shoring.
8. When it is specified that the work is to be carried out without removing cables, pipes, sewers etc. All of them shall be temporarily shored and saved from any damage.
9. The cost of all material and labour required for fencing/barricading in and protection against risk of accidents due to open excavation should be provided.

Equipment used:

1. Excavators
2. Tippers
3. Water Pumps

3) EMBANKMENT CONSTRUCTION:

Procedure:

1. The toe line and centre line are marked and pegs will be driven.
2. The material shall be dumped in site at respective location.
3. The material shall be spread in layers of uniform thickness exceeding 200mm compacted thicknesses over the entire width of the embankment by mechanical mean and will be graded with motor grader to the required camber.
4. Moisture comment of the material shall be checked and extra required will be added.
5. The moisture content of each byer shall be checked and it should be within range of OMC +1% to OMC 2%. If moisture content is found out of these limits the same will be brought within the limits by addition of water or by aeration as the case may be.
6. The compaction shall be done with the help of vibratory roller of 8 to 10 ton static weight. Each layer shall be thoroughly compacted to the densities specified.
7. Loose pockets if any will be removed and replaced with approved material.
8. The above stage shall be repeated till the top level of the embankment is reached to the specified tech and grades. The top levels are checked and shall be within the +20 and 25mm of the designed level.

Fig 3. Subgrade construction of road

6.SUBGRADE AND GRANULAR SUB-BASE CONSTRUCTION:

Procedure:

1. The toe line and center line are marked and pegs will be driven.

2. The material shall he dumped in site respective location.
3. The material shall be spread in layers of uniform thickness not exceeding 200mm compacted thicknesses over the entire width of the subgrade by mechanical mean and will be graded to the required camber.

Fig. 4. Laying of Granular Sub Base layer

4. Moisture comment of the material shall be checked and extra required will he added.
5. The moisture content of each layer shall be checked and it should be within the the range of OMC +15% to OMC-2%. If moisture content is found out of these limits the same will be brought within the limits by addition of water or by aeration as the case may be.
6. The compaction shall be done with the help of vibratory roller of 8 to 10 ton state weight. Each layer shall be thoroughly compacted the densities specified.
7. Loose pockets if any will be removed and replaced with approved material.
8. The above stages shall be repeated till the top level of the embankment is reached to the specified level and grades. The top levels are checked and shall be within the +20mm and -25mm of the designed level

4) WET MIX MACADAM (WMM) CONSTRUCTION:

Preparation of Mix

The individual materials gradation shall be checked and combined proportions shall be Mixed.

LAYING OF WMM-BASE:

1. Scope: Wet mix macadam base shall consist of laying and compacting clean. Crushed graded aggregate and granular material premixed with water to a dense mas on prepared sub base in accordance with the specifications.
2. Proposed Sample: Coarse aggregate proposed to be used in WMM are obtained by crushing the rocks, obtained from approved quarries. Before removing the rock.quarry area is stripped of earth loam clay and vegetable matter.

Independent tests will be carried out on the material as follows:

I. Sieve analysis
II. Los Angeles Abrasion test
III. Aggregate impact value
IV. Combined flakiness and elongation indices.
V. Modified proctor density
VI. Liquid limit, plasticity index of proportion through 425 Micron sieve.

Fig.5 laying of wet mix at kerudi hospital

3. Mixing Proposed Base material will be obtained by mixing various sizes of aggregates (as per approved max design) & water in the wet mix macadam plant.
4. Transportation: W.M.M. material will be carried to the site in dumpers of adequate capacity.
5. Laying and compaction: WMM. material will be laid in layers (150 mm compacted) on prepared sub base using mechanical pavers or motor grader to maintain required thickness and slope and to achieve finished surface in narrow areas, WMM will be spreaded manually, in layers.
6. Each layer will be compacted with 10 TV ibeo Roller, to achieve required degree of compaction Le. 98% of modified density. The areas not accessible to roller will be compacted with plate compactor or mini rollers.
7. Top surface will be checked for its designed levels before & after compaction & material will be removed or added as required.

5.APPLICATION OF PRIME COAT:

Preparation of Road Surface: Make clean the top surface of wet mix macadam by engaging labours with wire brush and all organic contents shall be blown up by using compressed air. The surface to be primed will be swept clean, free from dust and remain dry.

Application of Primer:

The primer will be sprayed uniformly over the dry surface using a self-propelled sprayer with the distribution bar at temperature of 30 to 60 degree centigrade.

6.DENSE BITUMINOUS MACADAM (DBM):

CONSTRUCTION PROCEDURE:

Laying of DBM:

The mix shall be laid with paver finisher. The paver shall have suitable loading hoppers and distribution mechanism The paver shall have electronic sensor paver and string wire shall be run on steel pegs driven on both sides at 10 m interval in straight portion and 5m interval in curved portions. The mix shall be laid manually in places where the paver movement is not possible. The compaction of DBM shall be done as per clause 501.6 and 501.7. The rolling shall be done with 80-100 KN smooth wheeled tandem rollers, 12-15 tones pneumatic tired rollers.The DBM should be laid in 2 layers.

7. BITUMINOUS CONCRETE LAYER (BC):

Fig. 6 Laying of Bituminous concrete at 48 sector

3.2.2 ROAD DRAINAGE SYSTEM:

The process of removing and controlling the access of surface and subsurface water within the right-of-way of a road is known as highway drainage. Highway drainage is an essential part of highway design and construction which remove the surplus water with in the highway limits and satisfactory dispose it. Road way drainage is mainly due to surface runoff from adjacent area, precipitation of rain and moisture rising by capillarity from the ground water table. Removal and diversion of surface water from road way and adjoining land is known as surface drainage. Removal of excess sub soil water from. the sub grade is termed as sub surface drainage.

Fig 7 . Side drain with precast slab

Requirements of Road Drainage System:

The Following are the requirements of good drainage system:-

- The road payment should have impervious top surface with sufficient camber. So that, the surface water drains off without percolate into the road pavement.
- The shoulders of road pavement should also have an impervious top surface with a proper cross slopes to drain off the water effectively towards a road sides.
- The side drains should have. sufficient capacity and longitudinal slope to carry away the collected water without overflow.
- Seepage & other sources of underground water, if any, should be tapped & the water should be drained off by sub-surface drains.

DIMENTIONS AND REINFORCEMENT DETAILS OF RCC DRAIN

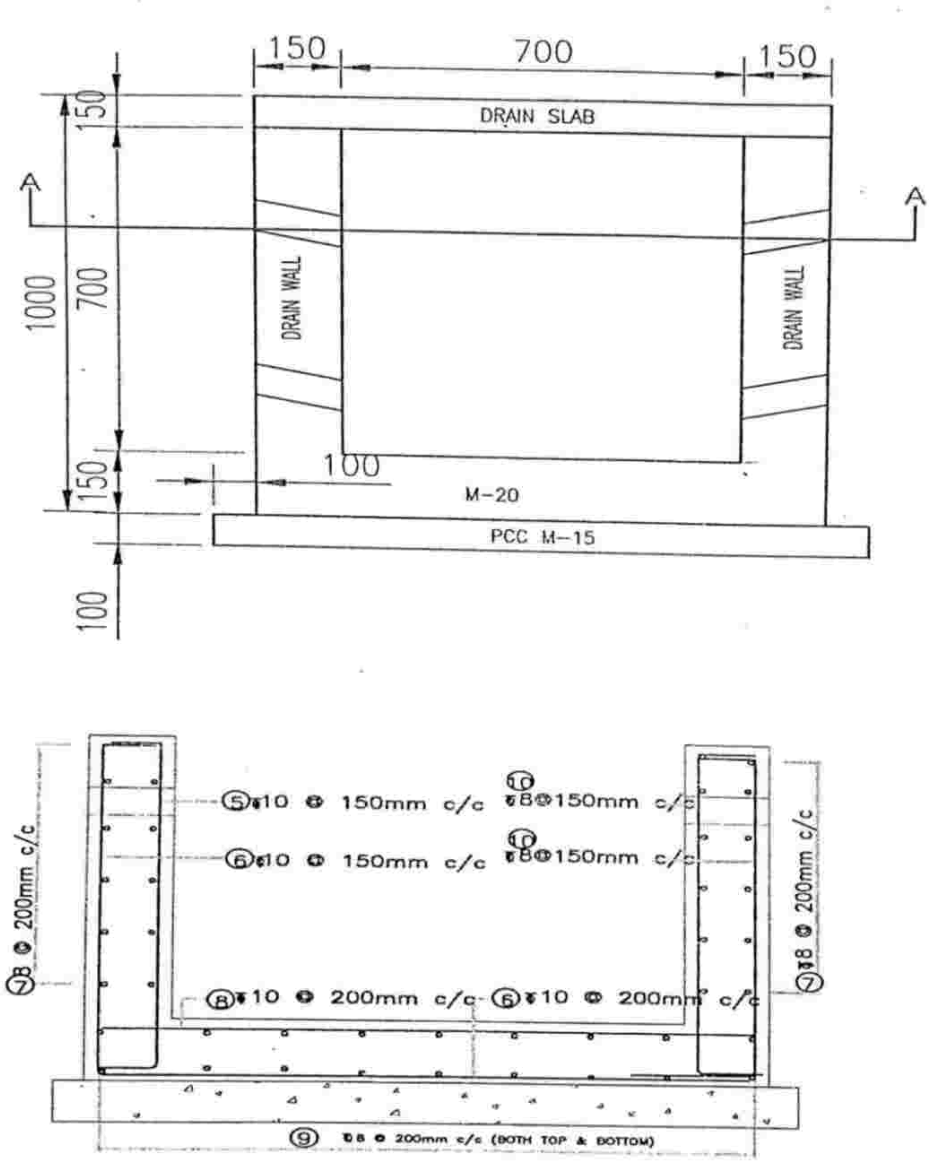


Fig 8. Typical section of Rcc drain

- **DRAIN DETAILS**

  Size of drain: outer dimension :-1m x 1m

  Dinner dimension:-0.7m x 0.7m

- **Reinforcement details:**

  Main reinforcement : Raft slab :-10mm dia @200mm c/c

  Side walls :- 10mm dia @150mm c/c

  Distribution reinforcement: 8mm dia @ 200mm c/c

- **Materials** :- Concrete : M25

  Steel. : FE500

Fig 9. Form work and reinforcement of rcc drain

Expansion Joints:-

It is a separation between two portions of the same structure is known as Expansion joints.As per IS- 456:2000, structures exceeding **45m** in length are designed with one or more expansion joint. As per IS 3414 which is a specific code for joints, it is mentioned as **30m.**

Width of Joint-20 to 25mm gap is sufficient to dissipate stresses due to thermal expansion. However during occurrence of earthquake, we need to ensure that the structures between the joints do not pound at each other.

* * * * *

3.2.3 Box Culvert:

Box culvert is culvert consisting of one or more numbers of rectangular or square openings, having their floor & top slabs constructed monolithically with abutments & piers is known as **Box Culverts.** Box culverts are made up of concrete and especially, RCC (Reinforced Concrete).

7.2 Layout of Construction of Culvert:

- The location and design of the culvert is based on the Qty of rainfall and runoff of a particular area obtained from the hydrological study and counter map.
- For establishing location of any bridge we are given centre line chainage of the given bridge.
- Dimension of all the components of bridge is decided by turning Auto level through various angles we can plot layout of our bridge.
- For providing better drainage slope of 1 in 100 is provided but slope is provided before construction of superstructure.

The Box culvert should perform following functions

The culvert with its appurtenant entrance and outlet structures should efficiently discharge water, bed load, and floating debris at all stages of flow.

Fig 10. Box culvert

1. It should be designed to accommodate increased runoff occasioned by anticipated land development.
2. The main function of the box culvert is to collect the water from drains and discharge it into the natural stream or nala.
3. Alignment should be such that water enters and exits the culvert directly. Any abrupt change in direction at either end will retard flow and cause ponding, erosion, or a build-up of debris at the culvert entrance. All of these conditions could lead to failure

Fig 11. Reinforcement of Box culvert

- **Box culvert details:**

  Size of Box culvert: 20m x1.4m x 1.4m of two

- **Reinforcement details:**

  Raft slab : Main reinforcement:-10mm dia @200 mm c/c
  Dist reinforcement :-10mm dia @250 mm c/c

  Substructure: Main reinforcement:-10mm dia @200 mm c/c
  Dist reinforcement :-10mm dia @250 mm c/c

  Top slab: Main reinforcement:-12mm dia @100 mm c/c
  Dist reinforcement :-10mm dia @200 mm c/c

  Haunch slab: 8mm dia @ 200mm c/c

- **Material properties:** Concrete :-M25
  Steel. :- FE500 (TMT)

Advantages of Box Culvert:

- The box culvert is a rigid frame structure and very simple in construction
- It is Suitable for non-perennial streams where scrub depth is not significant but the soil is weak.
- The bottom slab of the box culvert reduces pressure on the soil.
- Box culverts are economical due to their rigidity and monolithic action and separate foundations are not required.

3.2.4 RETAINING WALL:

A retaining wall is a structure designed and constructed to resist the lateral pressure of soil, when there is a desired change in ground elevation that exceeds the angle of repose of the soil. Retaining walls are used for supporting soil laterally so that it can be retained at different levels on the two sides. Retaining walls are structures designed to restrain soil to a slope that it would not naturally keep to (typically a steep, near-vertical or vertical slope). They are used to bound soils between two different elevations often in areas of terrain possessing undesirable slopes or in areas where the landscape needs to be shaped severely and engineered for more specific purposes like hillside farming or roadway overpasses.

Fig 12 . Reinforcement of retaining

8.2 Reason For The Construction Of Retaining Wall:

The existing Cement factory road is at a elevation of RL 517.0M and main highway road is at a elevation of RL 521.0M to meet the two levels the road construction has to be carried out in embankment and at two sides of road the provision of service road of width

5.0M will be constructed .The retaining wall is constructed to take up the load of the road embankment and provide the support for main road to act as a barrier. There are three types of retaining walls will be constructed of different height increasing step by step to meet the required elevation.

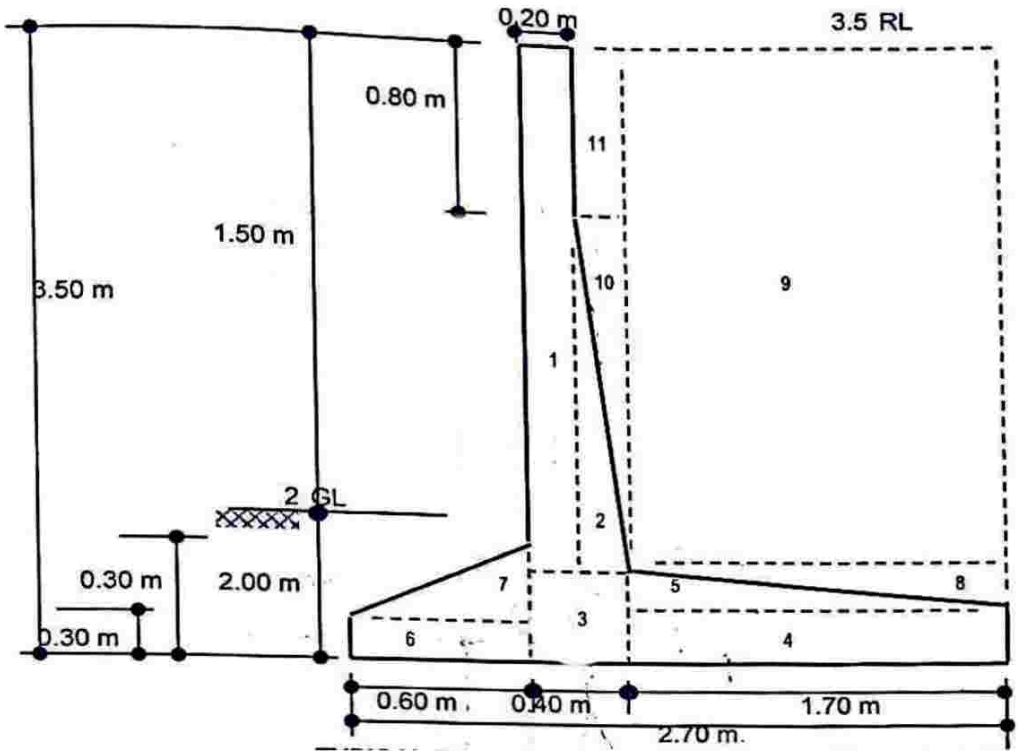


Fig 13. Dimension details of Retaining wall

- **Reinforcement details of retaining wall :**

Stem : Main reinforcement. :-16mm dia @150mm c/c

Distribution reinforcement :-10 mm dia @ 200mm c/c

Heel slab : Main reinforcement. :-10mm dia @200mm c/c

Distribution reinforcement :-10 mm dia @ 200mm c/c

Toe slab. : Main reinforcement. :-12mm dia @150mm c/c

Distribution reinforcement :-10 mm dia @ 200mm c/c

- **Material properties:** Concrete :- M30

Steel :- FE500 (TMT bar)

3.3 Issues or problems in execution:

There are various issues will arise site when the work is to be executed following are the some issues,

- The big problem in the road construction is rain and when the excavation work is carry outing the water will get logged in tranches.
- Vehicle moment at the time of laying of pavement.
- Protecting the materials from rain and proper site for the storage of materials.
- Improper coordination between labours and site engineer in the execution.
- Financial problems.
- Sometimes it is very difficult to prepare the moulds for concreting of structures as specified in drawing because of some difficult and irregular shape.
- Some times the ground strata will be very week for construction the we have to go for deep excavations until or unless we reach the hard strata.
- Electrical poles , transformers sand tress in the alignment of road.

3.4 Suggestions to solve the issues:

- Ensureing the proper communication between engineer ,contractor and labours.
- Pumping and removing the water from trenches before carry outing the construction activities.
- The contractor and labours should having the good relationship with the local people at site.
- Adequate supervision should be done by site engineer.
- Minimising the wastage of materials and punctuality in timing will reduce the cost of construction.
- Relocating the electrical pole from initial position to nearby location away from alignment with the permission guidence of Electrical board.

CHAPTER NO – 04

WATER TREATMENT PLANT BAGALKOT

4.1 INTRODUCTION:

WATER treatment is any process that improves the quality of water to make it more acceptable for a specific end-use. The end use may be drinking, industrial water supply, irrigation, river flow maintenance or many other uses. Water treatment removes contaminants and undesirable components, or reduces their concentration so that the water becomes fit for its desired end-use.

4.2 ABOUT THE TREATMENT PALNT:

A Jack well is constructed at Anadinni village located at a distance of about 1 km on upstream side of the Bannidinni Barrage across Ghataprabha River. The pumps are designed for 20 hours pumping and two number of 400 H.P vertical turbine pumps (one working and other one is standby) are installed in the Jack well. The raw water from the Ghataprabha river is being pumped and transported through 700 mm dia M.S. raising main over a distance of about 4.20 Km. to the Water Treatment Plant (WTP) at Gaddanakeri cross. One more pump house is constructed here also with installation of two number of 400 H.P.,Vertical turbine pumps (one working + one standby). The water after treatment is again pumped and transported through 700 mm dia MS raising main over a distance of 700 m to Ground Level Service Reservoir (GLSR) of 50 Lakh litres capacity located on Gaddanakeri Hillock at an elevation of RL 605.402 m. From this GLSR water is being supplied through gravity main and feeder mains to the various reservoirs located in the new and old Bagalkot Town. The CI & DI pipes of various diameters are provided for distribution net work in Unit-I.

The selection of the best combination of processes to treat water from a particular source depends on a number of factors. These factors include:

- the amount of suspended solids;
- the turbidity of the water;
- the nature of the suspended material;
- the chemical properties of the water (alkalinity and pH);
- the volume of water to be treated, and
- the availability of facilities, trained operators and supervisors.

4.3 Bagalkot Water Treatment Plant Process:-

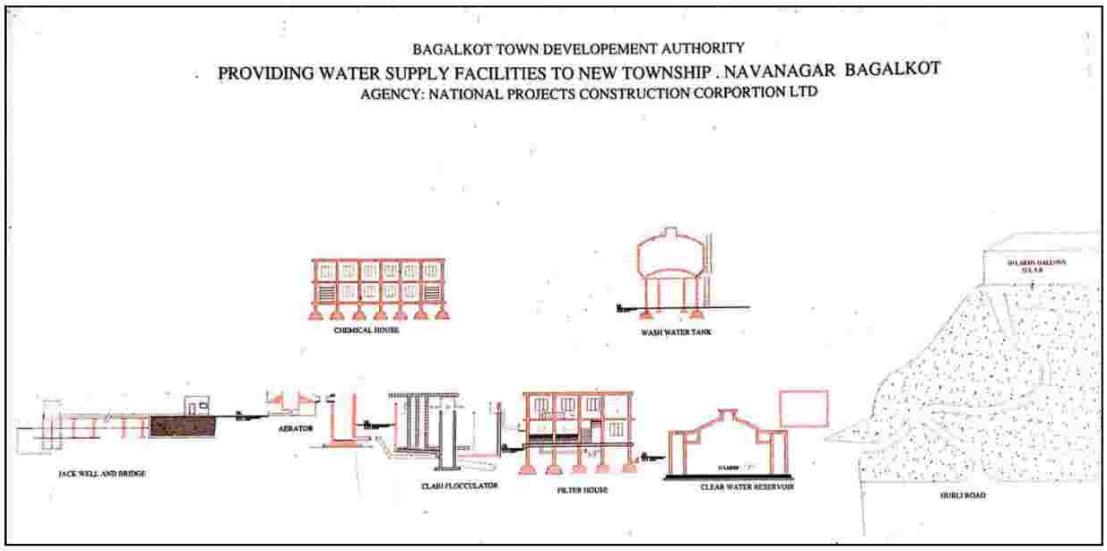


Fig 14 Steps involved in the Water treatment

1.SOURCE:

The water is drawn from the GHATAPRABHA River and process of screening is done to exclude floating matter in the pipes.

2.AERATION:

- It is the process of exposing the water to atmospheric air to eliminate gases such as carbon dioxide, hydrogen sulphide, and minerals such as iron and to increase the oxygen content.
- Aeration process is carried out in aerator.
- The water is drawn from the GHATAPRABHA River through 400HP motors by using jack well. And the diameter of the pipe is 700 mm.
- And the waste water is added here to recycle that which the water is used to clean the rapid sand filter bed.

Fig 15 .Aeration tank

Lab test and chemicals preparation

Before the treatment of raw water, the turbidity must be tested to check amount of suspended particles in water. After turbidity measuring, jar test take place in order to determine optimum required of coagulate and PH required for treating water. All chemicals are prepared and injected in water. After jar test, the optimum required coagulate is calibrated and inject in water to form floc in water treatment.The most coagulate usually used is aluminium sulphate (Al2 (SO4)3) called alum for flocculation. Then, polymer is also used to increase speed of flocculation.

3.FLASH MIXER:

It consists of rectangular tank provided with an impeller, by an electric motor. The impeller revolves at a speed of 100 to 120 rpm. In this process alum is added as coagulants. The quantity of alum is defends upon the turbidity test. Then the raw water is allowed to settle in sedimentation tank.

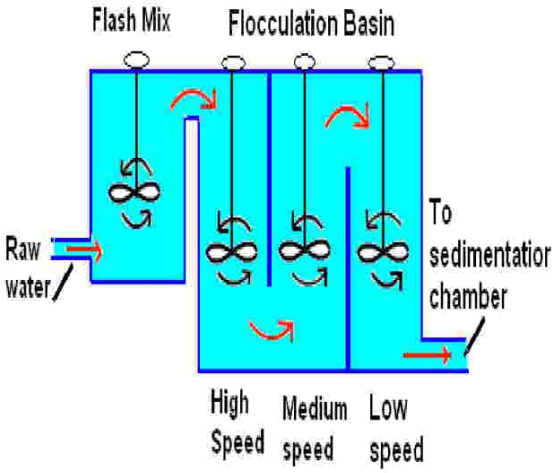


Fig 16. Flash mixer

4.SEDIMENTATION:

- After the process of flash mixers water flows to a tank called sedimentation.During sedimentation, floc settles to the bottom of the water supply, due to its weight. This settling process is called sedimentation.
- In sedimentation tanks 5,00,000 ltr of water can be stored at a time.
- It would take a very long time for all particles to settle out on the sloping floor of the tank get removed by means of a scraper.
- The scraper moves continuously around the floor at a very low velocity not greater than 4.5 m/hour.
- So that the all settled particles which are at the bottom is kept out from the sludge outlet. And the top surface flowing water is sent to the filtration process where the smaller particles are removed.

Fig 17 .Sedimentation tank

5.FILTRATION

- It is the process of allowing the water to pass through the layers of sand called media which acts as a strainers.
- In water supply treatment of Bagalkot they use rapid sand filter (Gravity type) and it allows high rate of filtration of about 4000 to 6000 litres/square metre/20 minutes.
- It consists of a rectangular tank of size about 3X4m or of surface area 10 to 30m^2 and are provided with media of very hard sand and gravel of different grades in layer.
- Rapid sand filters clogs rather rapidly and cleaning is, therefore necessary at an intervals of 24 hours . It is accomplished by an arrangement of pipes. Water through

the wash water storage tank. Which allows a reversal flow of water through the filter called “back washing” of filter.

- Then the wash water is again sent to aeration chamber for recycling of water.

6.POST-CHLORINATION:

- After the water has been filtered, a disinfectant (for example, chlorine, chloramine) may be added in order to kill any remaining parasites, bacteria, and viruses, and to protect the water from germs when it is piped to homes and businesses.
- The process of treating the water by chlorine is called chlorine.
- Chlorine is generally available in gas, liquid or solid form but here chlorine is added in the gas form.
- Chlorine is added with the water at the rate of 0.10 to 0.20 ppm per litres for the small flow of water and the solution fed into the filtered storage tank.

Fig 18. Mixing of chlorine with water

Fig 19.cylinders of chlorine gas of 900kgs capacity

7.STORAGE AND PUMPING:

- The filtered water is transferred to storage tank by using 400HP pumps.
- Actually there are two pumps are available one of them is for regular use. And other one is used by diesel generators when electricity is not available to pump the water.
- Working duration of pump is 12 to 14 hours
- The storage tank is constructed on the hill so the distribution of water is carried out by gravity.
- Storage tank size is 54mX15mX7m.
- Storage tank consists of two chambers, in each chamber 25,00,000 litres of water can be stored.

Fig 20. 400 HP PUMPS **STORAGE TANK**

4.4 SOME OF THE TESTS ARE CONDECTED ON WATER IN THE TREATMENT PLANT

Namely as follows;

1. TDS meter
2. PH meter
3. Turbidity
4. Alum jar Test

4.5 WATER QUALITY PARAMETERS AND DRINKING WATER STANDARDS

SL.NO.	PARAMETERS	UNITS	DRINKING WATER IS: 10500 – 1991	
			DESIRABLE	MAXMUM
1	Colour	Hazen units	5	25
2	Odour	-	Unobjectionable	-
3	Taste	-	Agreeable	-
4	Turbidity	NTIJ	5	10
5	pH value		6.5 to 8.5	No relaxation
6	Total hardness (as $caco_3$)	mg/l	300	600
7	Iron		0.3	1
8	Chlorides	mg/l	250	1000
9	Residual, free chloride	mg/l	0.2	-
10	Dissolved Solids	mg/l	500	2000
11	Calcium	mg/l	75	200
12	Copper	mg/l	0.05	1.5
13	Manganese	-	0.1	0.3
14	Sulphate	-	200	400
15	Nitrate	mg/l	50	No relaxation
16	Fluoride		1	1.5

CHAPTER NO – 5

SITE VISIT PHOTOGRAPHS

Fig 21. Explanation of Reinforcement work of Box Culvert at Bagalkot (Cement Factory Road) by Mr.Basavaraj Malagi

Fig 22. Road work Explanation by Mr.Gopal Rathod at the way of kerudi hospital

Fig 23.Optical Fiber Base (OFC) explanation by Mr.V.K.Chitavadagi

Fig 24. Excavation work of Box Culvert at Bagalkot Cement Factory Road

Fig 25. Formwork of Side Drain at Unit – 2 (Sector No 112)

Fig 26. Reinforcement work of Drain at Sector No. 111

Fig 27. Water Tank, Capacity of 5 Million Litres.

Fig 28.Clariflocculator explanation by Mr.Mukupi at BTDA Water treatment plant

Fig 29.Water testing laboratory at BTDA Water treatment plant

Fig 30. Slab Reinforcement explanation of server at unit-II by Mr.V.K.Chitavadagi

Fig 31.Curing of Box Culvert at Basaveshwar PU College circle

Fig 32. Box culvert construction Basaveshwar PU College circle

5.2 CONCLUSION

We can conclude that there is difference between the theoretical and practical work done. As the scope of understanding will be much more when practical work is done. As we get more knowledge in such a situation where we have great experience doing the practical work.

Being at under graduate level we have tried our best to make this internship the success. This internship has given an opportunity to recollect and re-coordinate and also good exposure to the various works like site works, quality evaluation, estimation, steel calculation etc. and engineering principles which have been covered in previous courses and open ended experiments. The various operations of the building have been analysed perfectly and the Indian codes have been followed.

TECHNICAL SKILLS DEVELOPED:-

The foremost basic knowledge in site work is the quality, quantity, safety and time management. From this internship we got an opportunity to develop all these things. The internship helped to develop following Technical Skills:

1. Ability to read and understand complex drawings.
2. Ability to understand and apply complex technical specifications, standards, and procedures.
3. Ability to perform simple mathematics and solve engineering problems.
4. Knowledge of basic concrete construction.

NON-TECHNICAL SKILLS DEVELOPED:-

Non-technical things that help us nurture our self for a better future include time management, good communication and appropriate solutions for different problems in review this internship has been an excellent and rewarding experience. We have been able to meet and network with so many people that we are sure will be able to help us with opportunities in the future. One main thing that we have learned through this internship is time management skills as well as self- motivation.

The entire period proved to be a good source of practical exposure. At the end of the internship now we feel our self quite equipped to face the problems in field of construction and office.

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Sri BVV Sangha's

Basaveshwar Engineering College, (Autonomous) Bagalkot-587102

(Government Aided Institution and permanently affiliated to Visvesvaraya Technological University, Belagavi & accredited by NAAC with 'A' grade from 2017-2022)

Attendance of the students during Internship

6TH Semester (UG)

Company/Authority/Department/Internship Firm Name :Bagalkot Town Development Authority

Name of the Student: Saiprakasha Rathod

USN No: 2BA19CV424

Week 1	Date	Signature of the student	Signature of the staff in charge	Remarks
Day 1	01-09-2021			
Day 2	02-09-2021			
Day 3	03-09-2021			
Day 4	04-09-2021			
Day 5	06-09-2021			
Day 6	07-09-2021			
Week 2				
Day 1	08-09-2021			
Day 2	09-09-2021			
Day 3	10-09-2021	Holiday		
Day 4	11-09-2021			
Day 5	13-09-2021			
Day 6	14-09-2021			
Week 3				
Day 1	15-09-2021			
Day 2	16-09-2021			
Day 3	17-09-2021			
Day 4	18-09-2021			
Day 5	20-09-2021			
Day 6	21-09-2021			
Week 4				
Day 1	22-09-2021			
Day 2	23-09-2021			
Day 3	24-09-2021			
Day 4	25-09-2021			
Day 5	27-09-2021			
Day 6	28-09-2021			

ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು,
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ಬಾ. ಪ. ಅ. ಪ್ರಾ. ವಿಭಾಗ ನಂ-2,
ಬಾಗಲಕೋಟೆ

CHAPTER 1

INTRODUCTION

1.1 General

Any building used by the industry to accommodate the production activity, stock raw materials, stock finished product before supply is known as an industrial building. These buildings are used for workshop, warehouse etc. An economy of an industrial building depends on the configuration of the structure, type of roof truss and portal frame utilized, forces acting on building and selection of steel sections needed as per force employed. Buildings are designed to reduce energycosts and to achieve a high degree of sustainability. To reduce the costs, manufacturer adopted the Pre-Engineering Building concept.

Steel is extensively used in the construction of industrial building of larger spans where concrete construction is not feasible or when construction tome is critical. A Structural steel is a material used for steel construction, which is formed with a specific shape following certain standards of chemical composition and strength. They can also be defined as hot rolled products, with a cross section of special forms like angles, channels and beams/joists. There has been an increasing demand for structural steel for construction purposes in India. Steel has always been more preferred to concrete because steel offers better tension and compression thus resulting in lighter construction. Usually, structural steel uses three-dimensional trusses hence making it larger than its concrete counterpart. As far as the elasticity concerned the Steel follows hooks law very accurately.

In India conventional steel constructions are most popular because of their ease in construction, low cost, availability of manpower for erection & fabrication and availability of standard specifications.

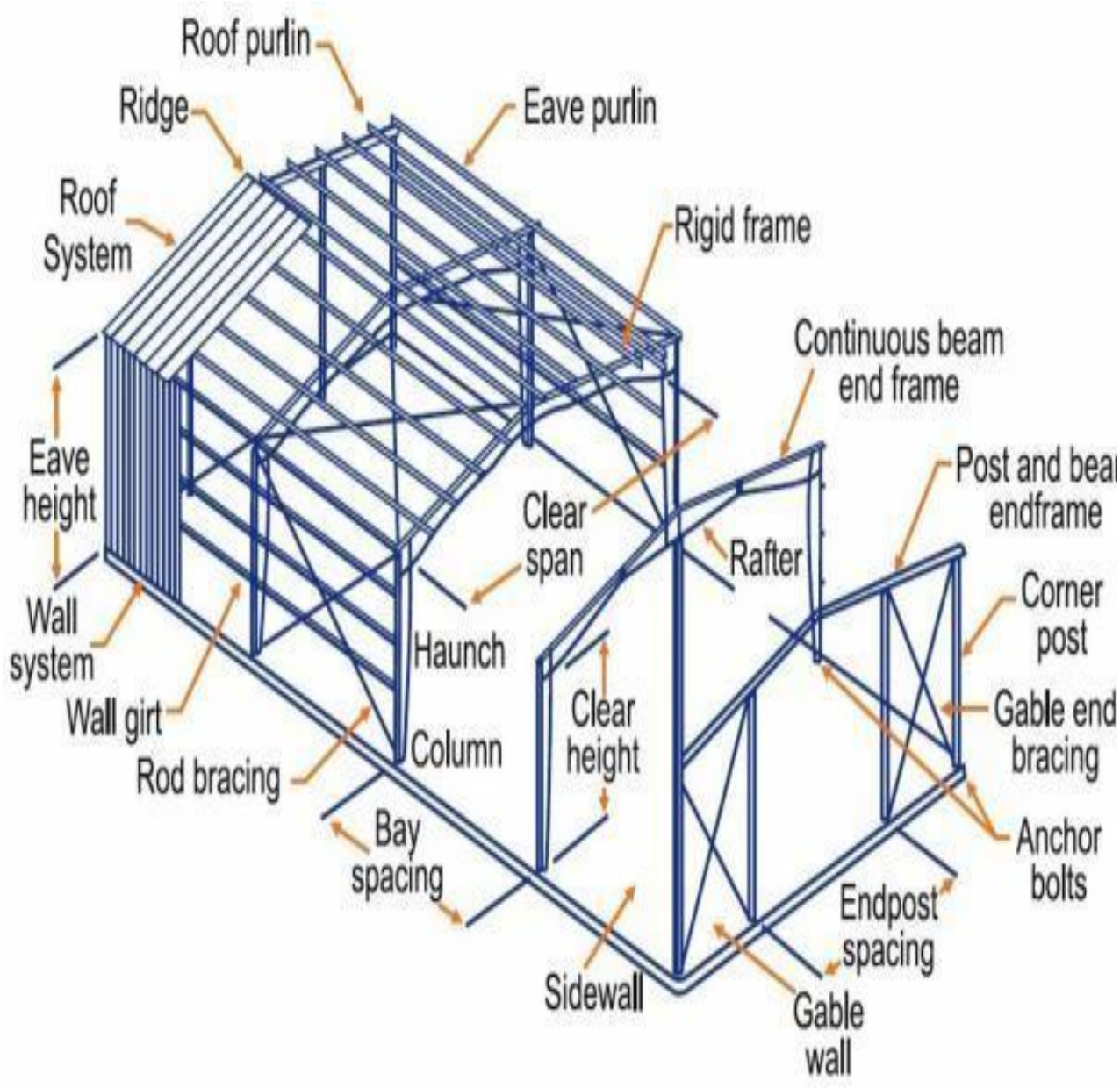


Fig 1. Industrial Steel Building

1.1 COMPONENTS OF STEEL BUILDING

Roof: The roof forms the topmost component of a building structure. It covers the top face of the building. Roofs can be either flat or sloped based on the location and weather conditions of the area. Roofs have been constructed in a wide variety of forms—flat, pitched, vaulted, domed, or in combinations—as dictated by technical, economic, or aesthetic considerations. The function of roof is to protect against rain, snow, sunlight, wind and extremes of temperature.

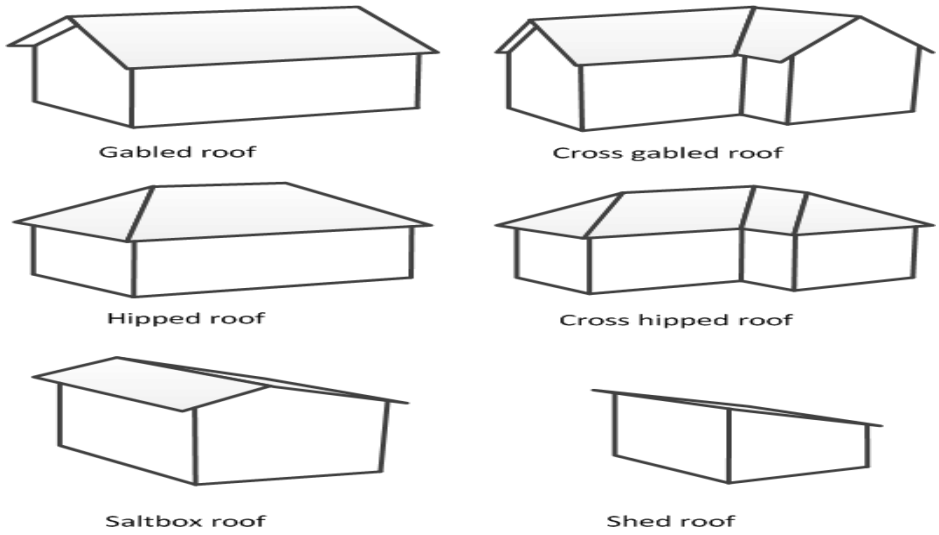


Fig 2. Types of roofs

Parapet: A dwarf wall or heavy railing around the edge of a roof, balcony terrace or stairway designed either to prevent those behind it from falling over or to shelter them from attack from the outside. Parapet wall provides safety for movement. It prevents any accidents due to falling over at the edge of the roof.

Fig 3. Parapet wall

Lintel: A horizontal support of timber, stone, concrete, or steel across the top of a door or window. Lintels are constructed above the wall openings like doors, windows, etc. Normally, lintels are constructed by reinforced cement concrete. In residential buildings, lintels can be either constructed from concrete or from bricks.

Whenever openings are made in the wall there is a concentrated force above the opening thus, the function of the lintel is the same as a beam, it transfers the structure load to its supports. Sometimes lintels are used as decorative architectural elements.

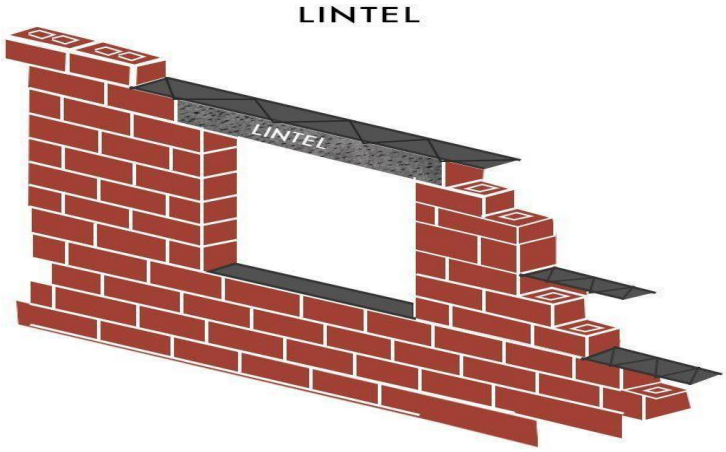


Fig 4. Lintel

Plinth beam: Plinth beam is a reinforced concrete beam constructed between the wall and its foundation. It is mandatory to provide plinth beam in areas that prone to earthquake. Construction of plinth beam above the natural ground is another application of this type of beam. Plinth beam is provided to prevent the extension or propagation of cracks from the foundation into the wall above when the foundation suffers from settlement. Plinth beams distributes the load of the wall over the foundation evenly.

Fig 5. Plinth beam

Foundation: The Foundation is a structural unit that uniformly distributes the load from the superstructure to the underlying soil. This is the first structural unit to be constructed for any building construction. A good foundation prevents settlement of the building.

Fig 6. Foundation

Sag rod: These are round sections rods and are fastened to the web or purlin. The roof covering in industrial buildings are not rigid and do not provide proper support. Therefore, sag rods provided between adjacent purlins to extend lateral support for purlins in their weaker direction. A sag rod is designed as a tension member to resist the tangential component of the resultant of the roof load and purlin dead load. The tangential component of the roof load is considered to be acting on the top flange of purlins, here as the normal component and purlin dead load is assumed to act at its centroid. Therefore, the sag rod should be placed at a point where the resultant of these forces act.

Fig 7. Sag rod

Principal Rafter: The top chord member of a roof truss is called as a principal rafter. They mainly carry compression but they may be subjected to bending if purlins are not provided at panel points.

Usually, the purpose of having a larger rafter is to carry a purlin which supports the rafters in each bay.

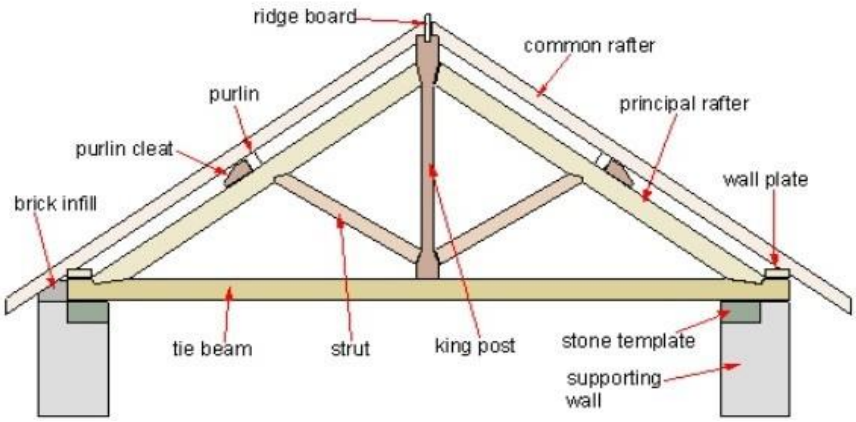


Fig 8. Principal Rafter

Roof Truss: Roof trusses are elements of the structure. The members are subjected to direct stresses. Truss members are subjected to direct tension and direct compression.

Function of roof truss: Supports and strengthens the roof framework.

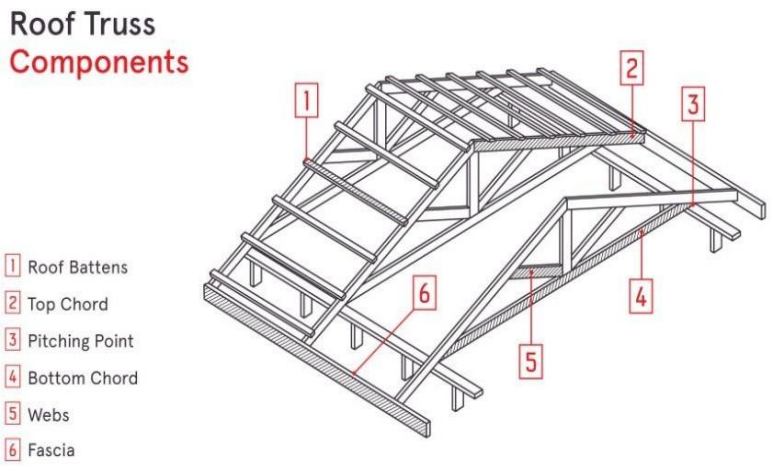


Fig 9. Roof Truss

Gantry Girder: Gantry girders are designed as laterally unsupported beams. Overhead traveling cranes are used in industrial buildings to lift and transport heavy jobs, machines, and so on, from one place to another. They may be manually operated or electrically operated overhead travelling crane. A crane consists of a bridge made up of two truss girders which move in the longitudinal direction. To facilitate movement, wheels are attached to the ends of crane girders. These wheels move over rails placed centrally over the girders which are called gantry girders.

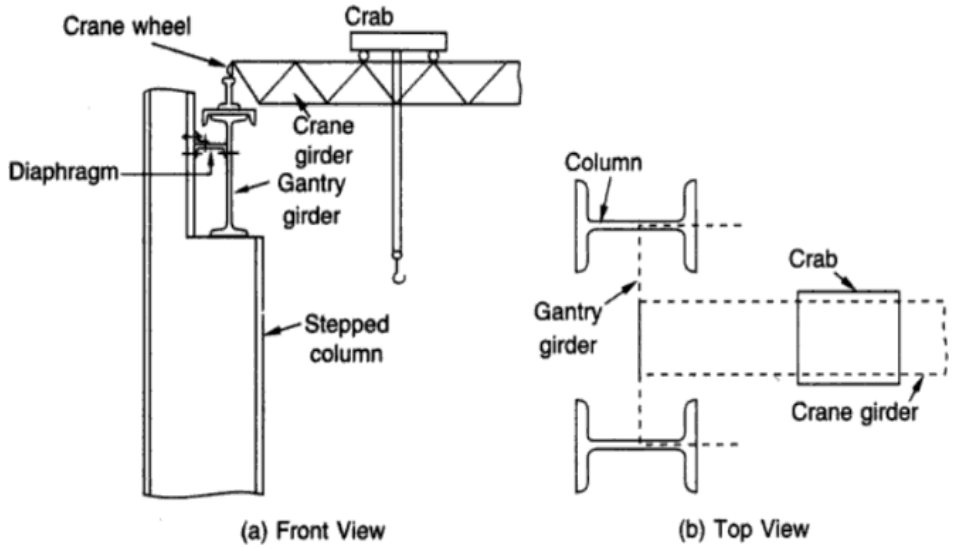


Fig 10. Gantry Girder

Brackets: Brackets types of connections are made whenever two members to be secured together do not intersect. Brackets can support many architectural items, including a wall, balcony, parapets, eaves, the spring of an arch, beams, pergola roof, window box, or a shelf.

Fig 11. Brackets

Roof Purlin: Purlin is a horizontal beam or a bar user for structural support in structures, most often below the roof. Purlins are supported either by a building's rafters or its walls. The most commonly used in metal buildings, but in wood frame structures, these also replace closely packed rafters.

A roof's purlins support the roof Deck's weight. The roof deck is the wooden panel, ply board or sheet metal which creates the roof surface.

Fig 12. Roof Purlin

Eave Purlin: The eave purlin runs the length of the building and provides a fixing point for the wall and roof sheeting.

They are used where side wall intersects with the roof, using top flange that helps support the roof and a web that help supports the walls.

Rigid frame: A rigid frame is the load-resisting skeleton constructed with straight or curved members interconnected by mostly rigid connections, which resist movements induced at the joints of members. . Its members can take bending moment, shear, and axial loads.

Fig 13.Rigid frame

Bracings: A bracing system serves to stabilize the main girders during construction, to contribute to the distribution of load effects and to provide restraint to compression flanges or chords where they would otherwise be free to buckle laterally.

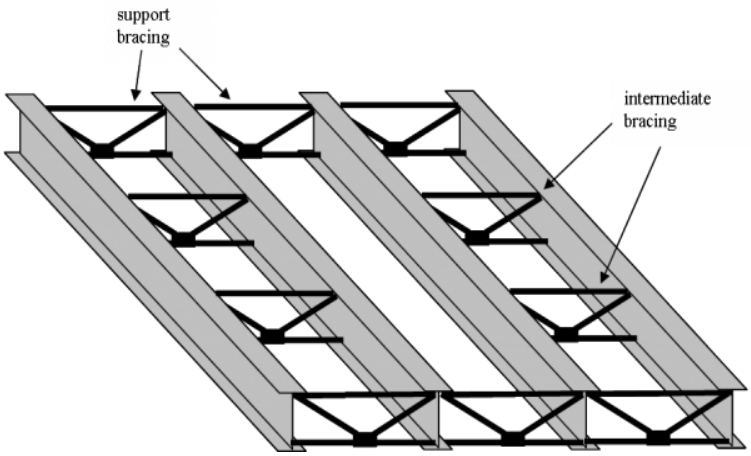


Fig 14. Bracings

Gable end: A gable is a section of wall located at the end of a pitched roof, between the edges of the intersecting pitches. It is usually triangular and extends from the eaves to the ridge, although the shape and detailing depends on the particular structural system used for the roof.

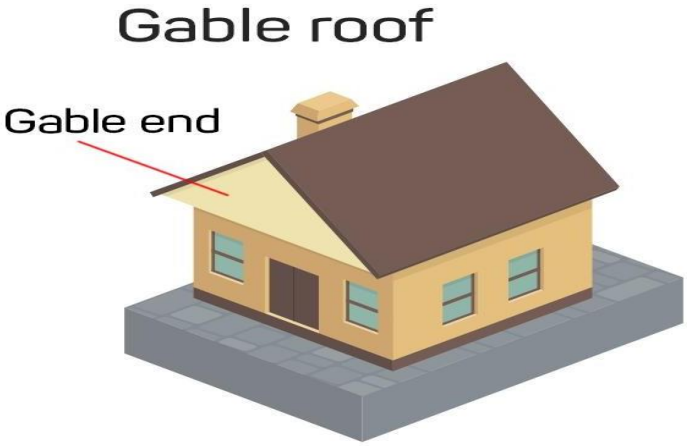


Fig 15. Gable end

Haunch: A haunch is a projection (usually from a wall) which another element such as a beam or slab rests on.

There is a need of haunches that provide a slight bend at the corners so that the stresses are not accumulated and make the structure vulnerable to fail or deform. Hence, haunches play an important role in withstanding the applied loads and forces.

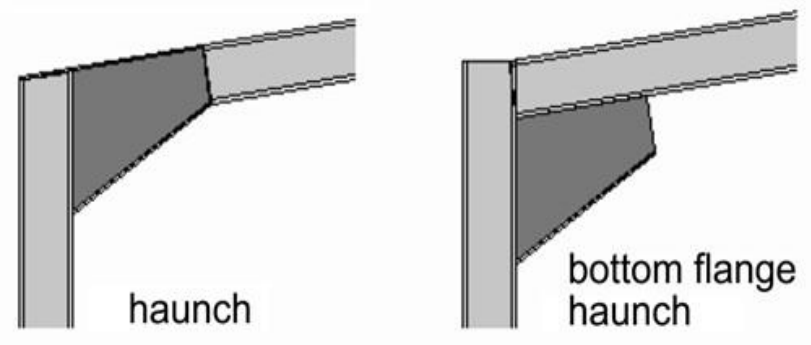


Fig 16. Haunch

Rafters: Rafter is a structural component that is used as a part of a roof construction. Though typically it runs from the ridge or hip of the roof to the wall plate of external wall. Generally, rafters are laid in series, side by side, providing a base to support, roof decks, roof covering, etc.

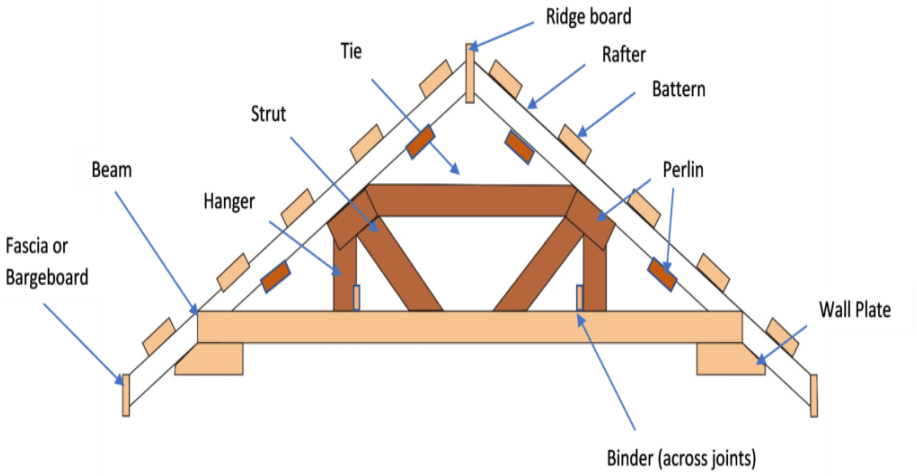


Fig 17. Rafters

CHAPTER 2

LITERATURE SURVEY

2.1 Literature Review

Mr. Deepak Dnyandev Nalawade, G.V. Joshi (March 2020) 1.

In this research paper, the analysis was done using the software package STAAD Pro V8i, which proved to be premium software of great potential in analysis and design sections of construction industry. The 2D analysis and design on industrial building was carried out according to industrial requirement. Structural arrangement as 2d gable portal frame was analyzed and design with plastic theory. Behavior of truss column structure and gable portal frame was compared.

Shivani Meher, Ruchita Nar (February-2018) 2.

This topic of work was decided as to know the different types of force/load effects to be considered while designing industrial warehouse with the help of literature review. AutoCAD plan was prepared followed by load calculations, based on which different members like truss members, columns, purlins were selected and designed. This structure was proposed to design according to IS 800:2007 and the dead, live, the wind load analysis is done according to IS 875: 1987.The conclusion was made that warehousecan be designed easily adopting simple design procedure and IS specifications.

D.S. Vijayan, K. Naveen Kumar, S. Aravindan (October 2019) 3.

The target of this analysis was to propose straightforward however innovative and effective LLRSS (Lateral load Resisting structural system) or structural technology and methodology for the unstable management which might be employed in new similarly as previous industrial steel structures. This study results satisfied the steel frames under stability and economical cases. This paper concluded that, considering economical point of view Global bracings much cheaper than to the other cases of bracings.

Andrea E, Surovek, Bulent N (June 2006) 4.

This paper gave an overview of the elastic analysis and design procedures in AISC (2005) as well as specific second-order distributed plasticity methods upon which, in part,these procedures were based. The relationship between the AISC elastic provisions and the refined inelastic methods was explained. The paper highlights one interpretation of the AISC inelastic analysis and design provisions that greatly facilitates the application of elastic-plastic hinge methods of analysis. The paper closes by presenting four basic examples selected to illustrate key characteristics of each of the methods.

Sagar D, Wankhade, Prof. P. S. Pajgade (June 2014) 5.

In this paper Industrial Steel truss Building was compared with Pre-engineering Buildings of same dimension. Design was based on IS 800-2007 (LSM), load considered in modeling were Dead load, Live Load, Wind load along with the combinations as specified in IS.

Dinesh Kumar Gupta, Mirza Aamir Baig (2017) 6.

This project work was proposed to carry out the design of an industrial steel storage shed by limit state method based on IS 800-2007 (LSM) and comparing the results with the same obtained by working stress method based on IS 800- 1984, for a structure with the same dimensions & loading. In this paper, structure was modeled in STAAD Pro, analysisand design software and full 3D model was generated. The project was all about analysis of loads & forces acting on the members of the above structure & their design. The main aim of the project was to provide which method was economical and provide more load carrying capacity and high flexural strength. From this they concluded that limit state method was more reliable and economical than the working stress method for designing structure. Limit states to design, provide consistent safety and serviceability.

Ms. Aayillia. K. Jayasidhan, Mr. Abhilash Joy (March 2015) 7.

The analysis was done using the software package STAAD Pro V8i, which proved to be premium software of great potential in analysis and design sections of construction industry. All the structural components were designed manually and detailed using AutoCAD 2013.The analysis and design was done according to standard specifications to the possible extend.

Yash Patel, Yashveersinh Chhasatia (April 2016) 8.

This paper was regarding the economy, load carrying capacity of all members and their relative safety measures. Economy was the main goal of this paper including comparison of conventional structures with tubular structure for given conditions. Analysis of shed's elements was carried out by Staad Pro V8i computer software, with manually applying Indian Standards, several excel sheets for various structural elements like Purlin, Roof Truss, compression member, Tension member were carried out using Microsoft office excel. Estimation sheet was prepared for each conventional roof truss section as well as tubular roof truss section.

K. Prabin Kumar, D. Sunny Parkas (2018) 9.

The calculations of various loads acting onto the structure were done using Indian code provisions. Load combinations were developed and the foundation design was done based on the loads acting the base of the structure. The design of the hanger was done and analysis of the structure was carried out using both manually and STAAD.PRO software.

2.2 OBJECTIVES:

- Planning of Industrial Steel Building.
- Analysis and Design of various components of Industrial Steel Building.
- Estimation of various quantities of components.
- Comparison by manual calculation.

CHAPTER 3

3.1 METHODOLOGY:

In this project we are going to design and analyse the industrial steel building of size 20.23m*27.23m by using Staad Pro and then compare it by manual calculation.

The plan, Section and Elevation of the building is as shown.

3.1.1 DESIGN OF TRUSS

For the design of Industrial sheds, we have considered two approaches with 4 STADD models.

Model 1: Design of truss members with angular sections and steel column

Model 2: Design of truss members with angles and RC column

Model 3: Design of truss members with tubular sections and steel column

Model 4: Design of truss members with tubular sections and RC column

3.1.2 DESIGN OF RC FOOTINGS

A separate excel sheet has been developed and the output of the same has attached.

3.1.3 DESIGN OF RC COLUMNS

Since the load was less and the moment was more, the design details are given in the output file.

Model 1: Design of truss members with angular sections and steel column

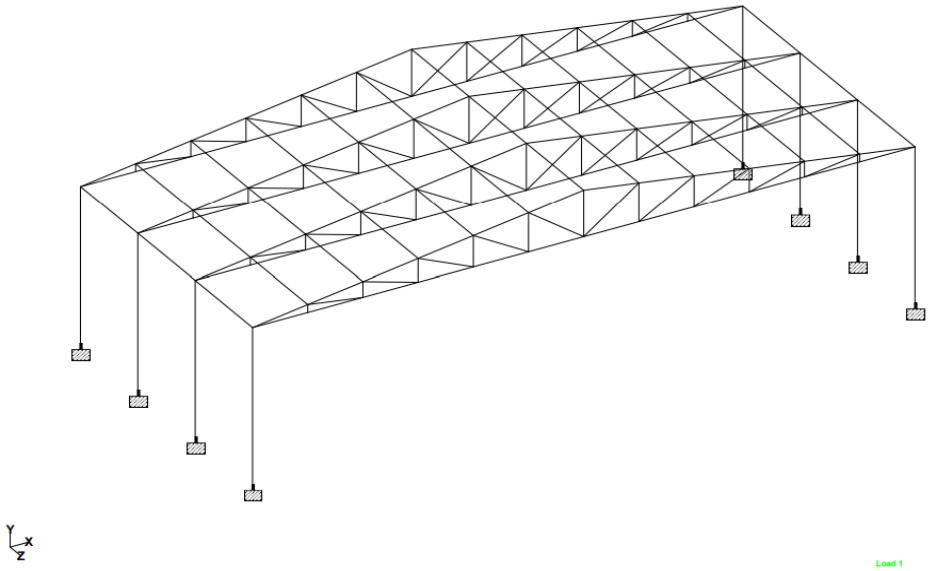


Fig 18. Whole Structure

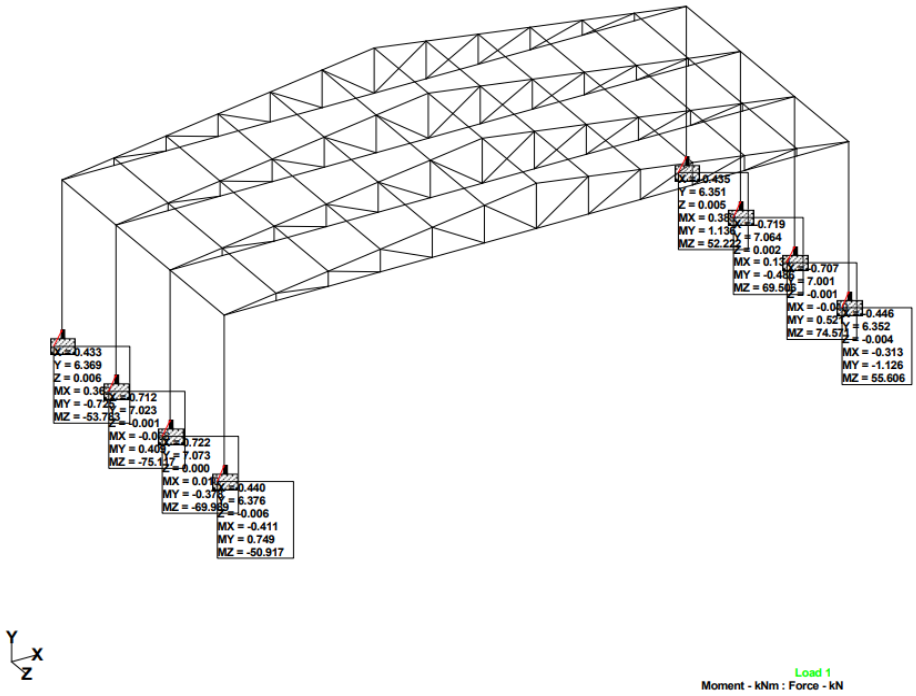


Fig 19. Support Reactions

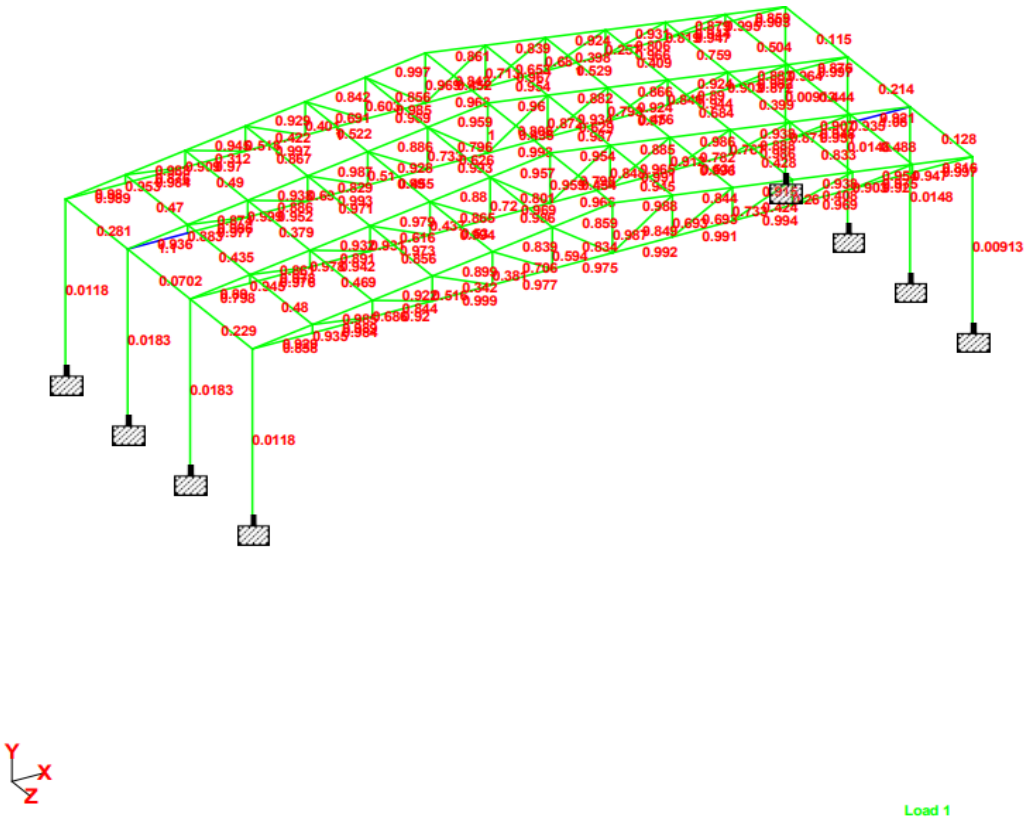


Fig 20. Interaction Ratio

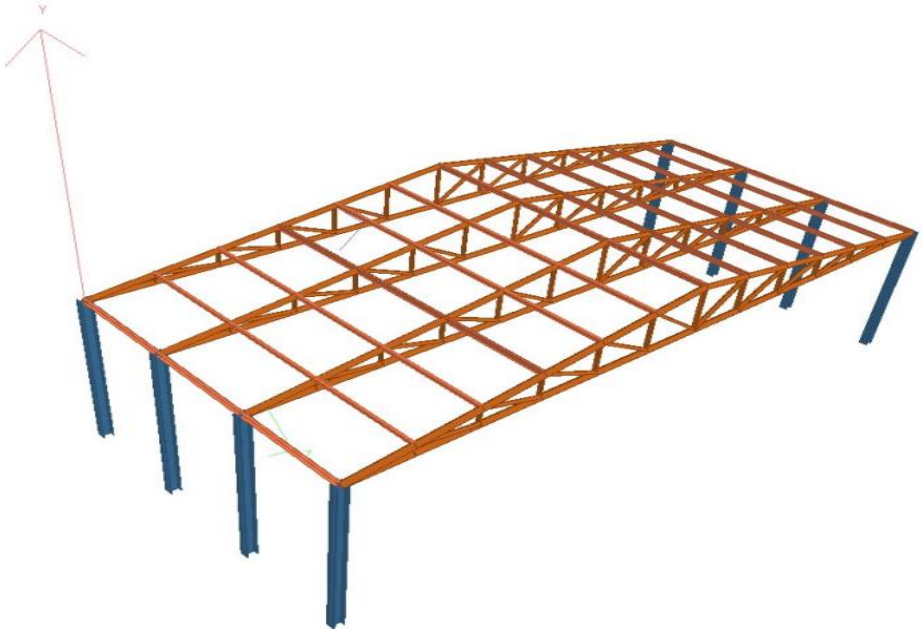


Fig 21. 3D rendered view

Model 2: Design of truss members with angles and RC column

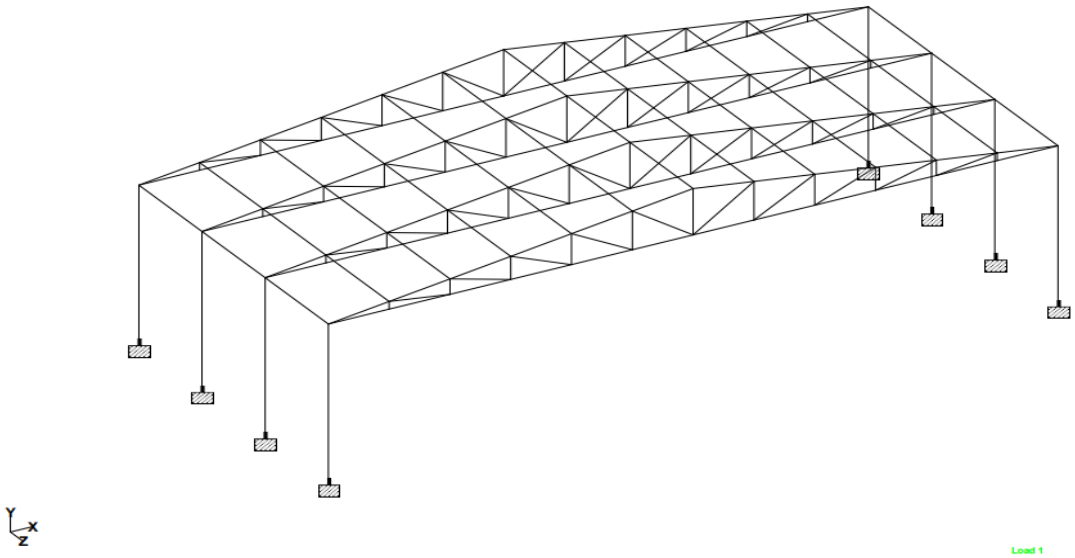
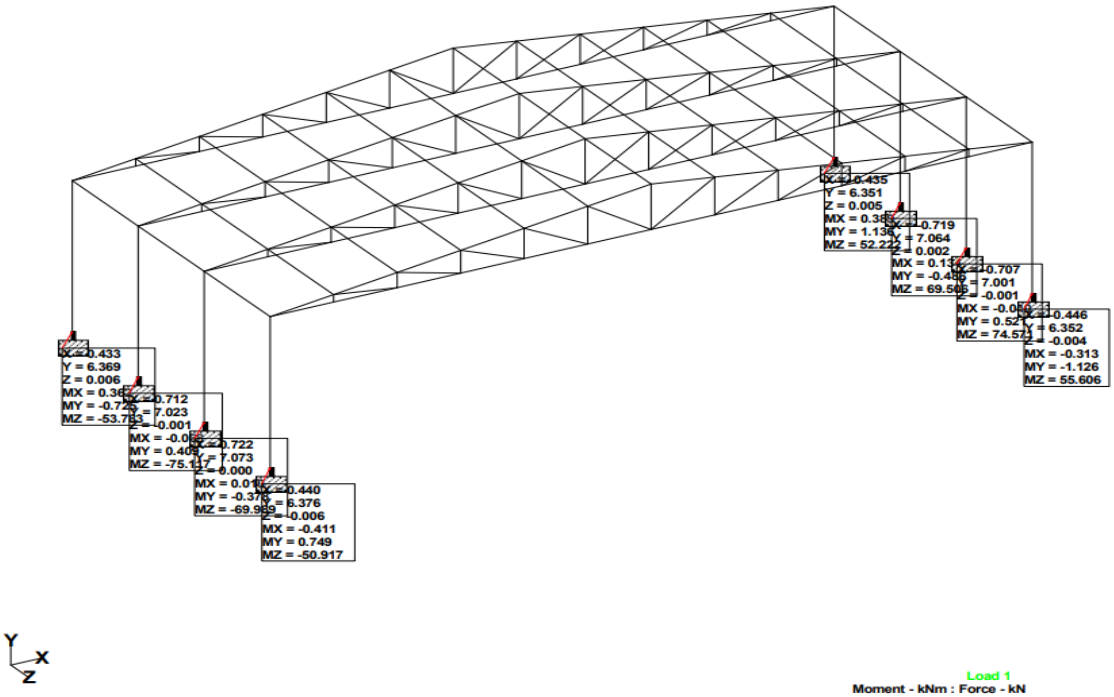


Fig 22. Whole Structure



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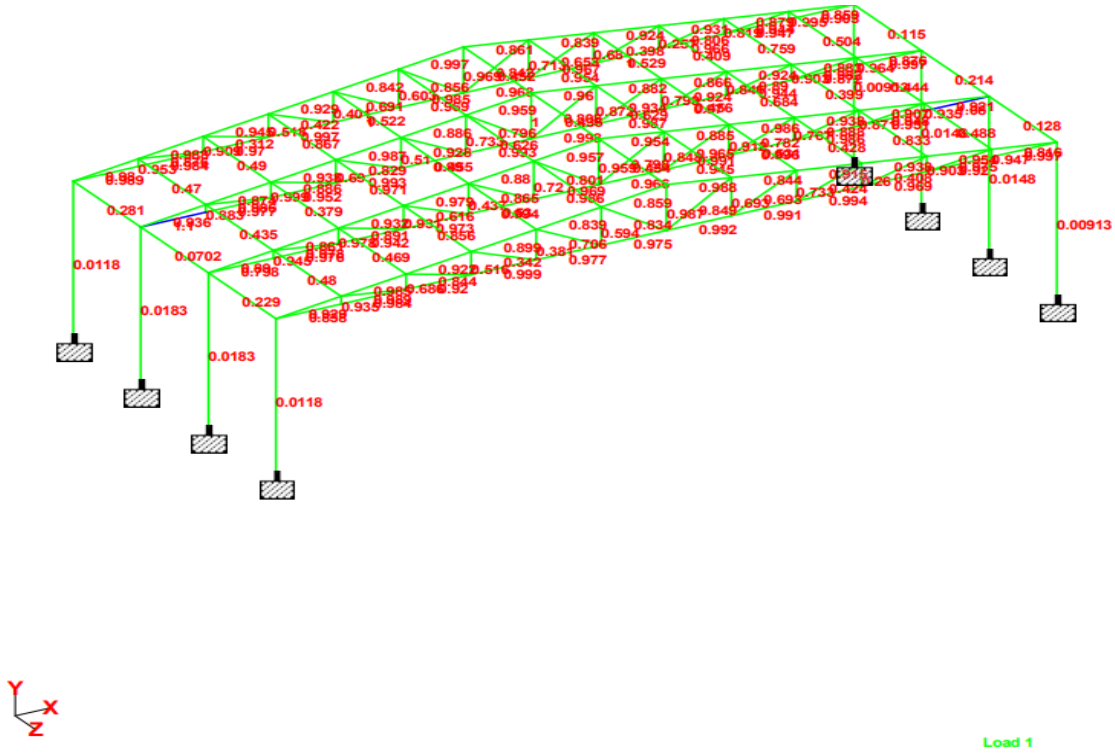


Fig 24. Interaction ratio

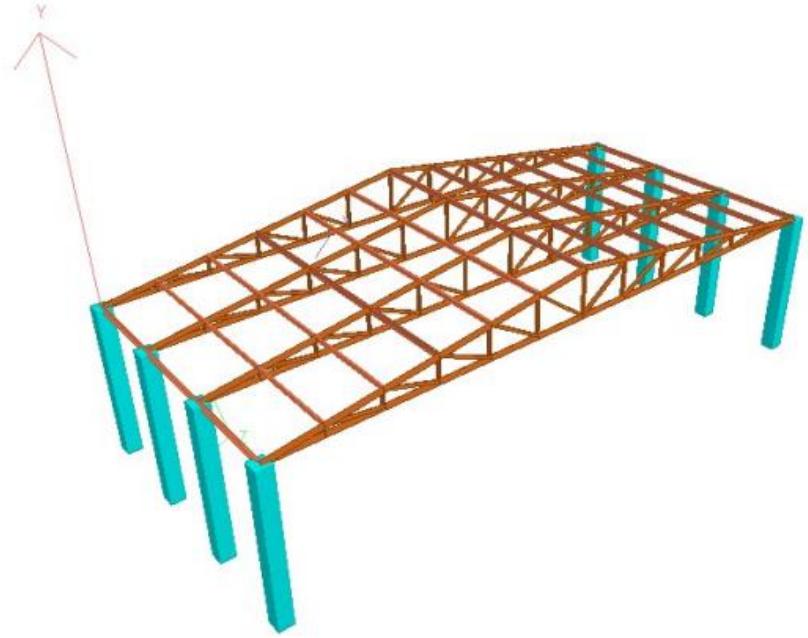


Fig 25.3D rendered view

Model 3: Design of truss members with tubular sections and steel column

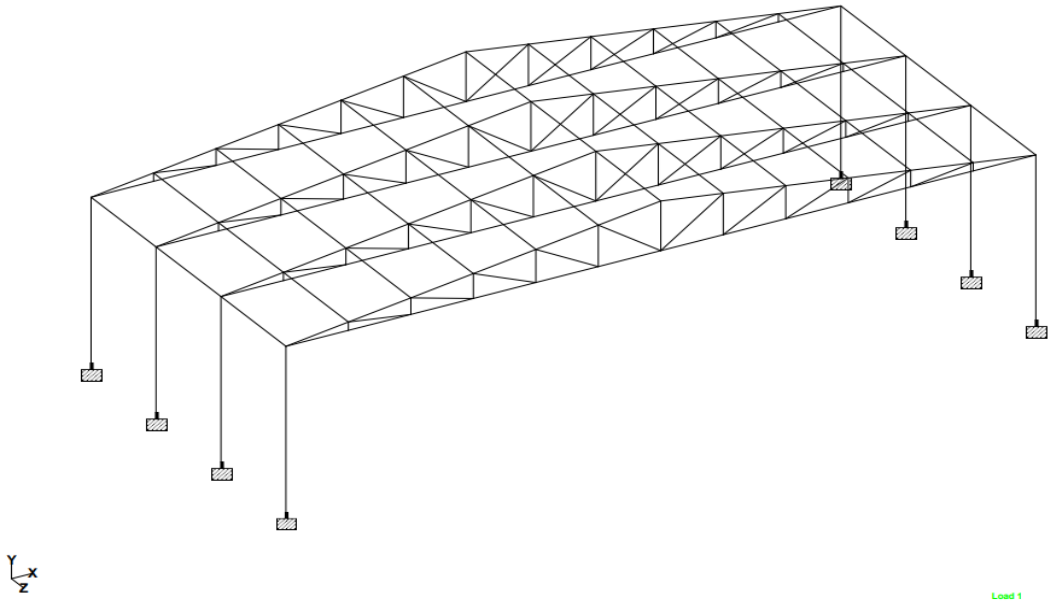
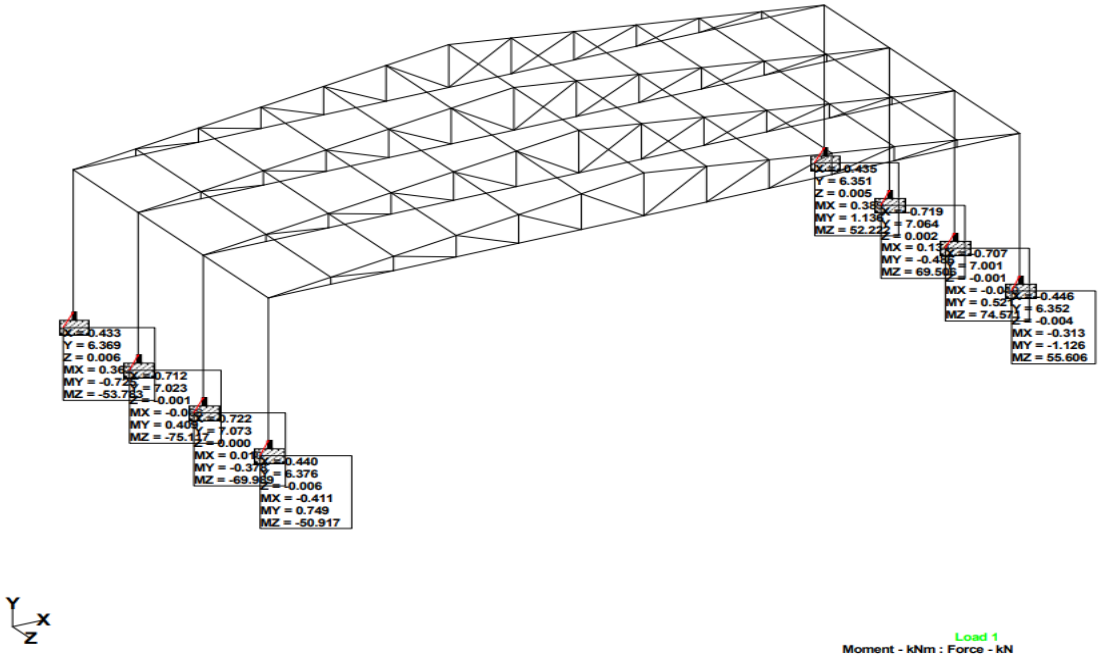


Fig 26. Whole Structure



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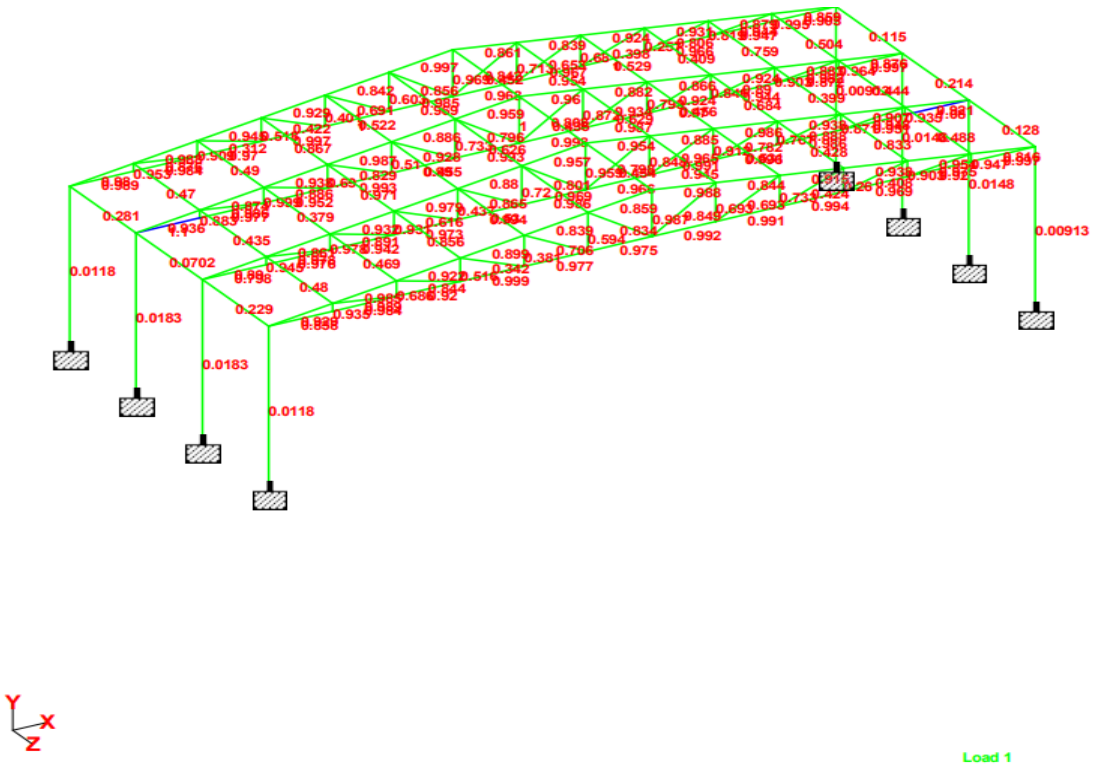


Fig 28.Interaction Ratio

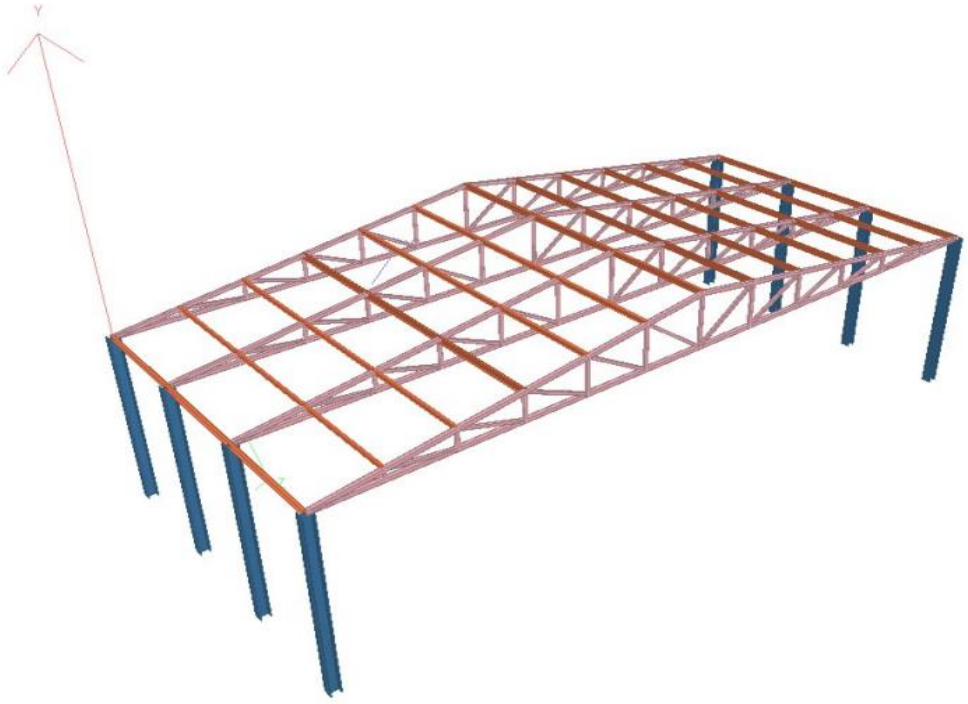


Fig 29.3D rendered view

Model 4: Design of truss members with tubular sections and RC column

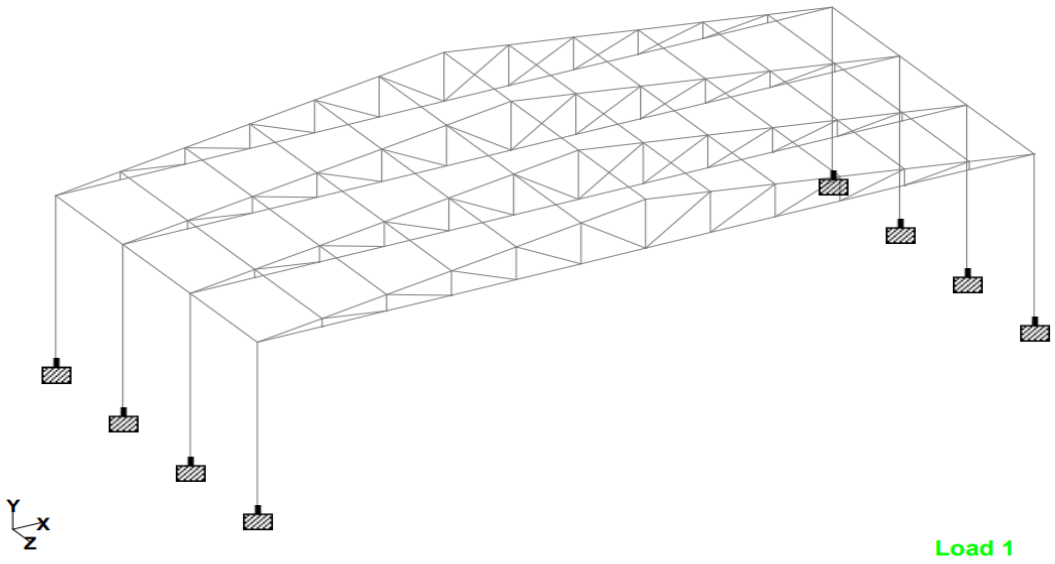


Fig 30.Whole Structure

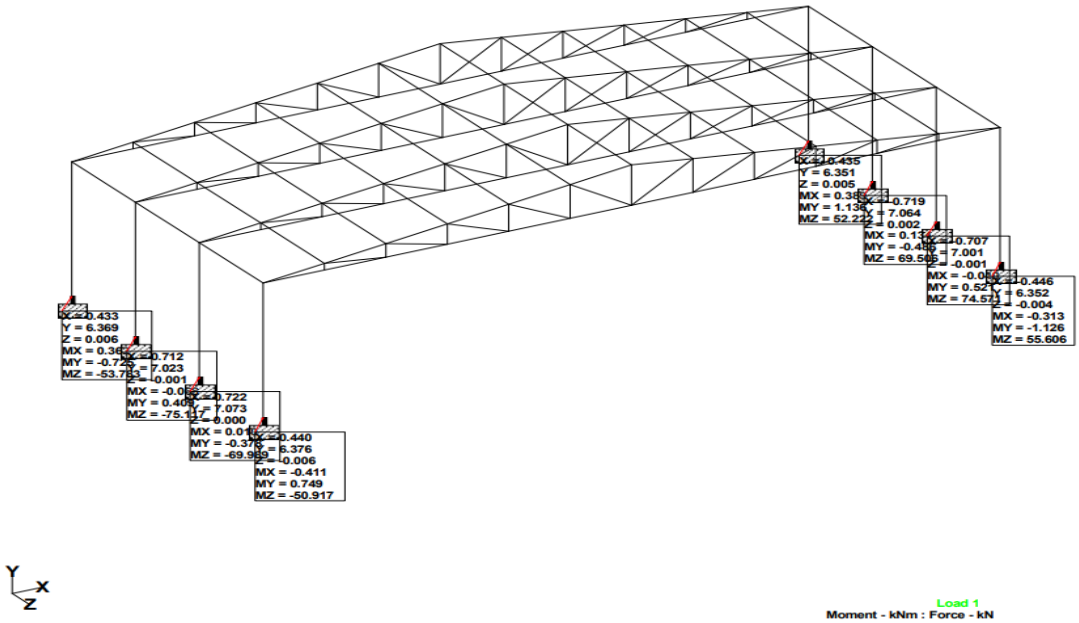


Fig 30.Support Reactions

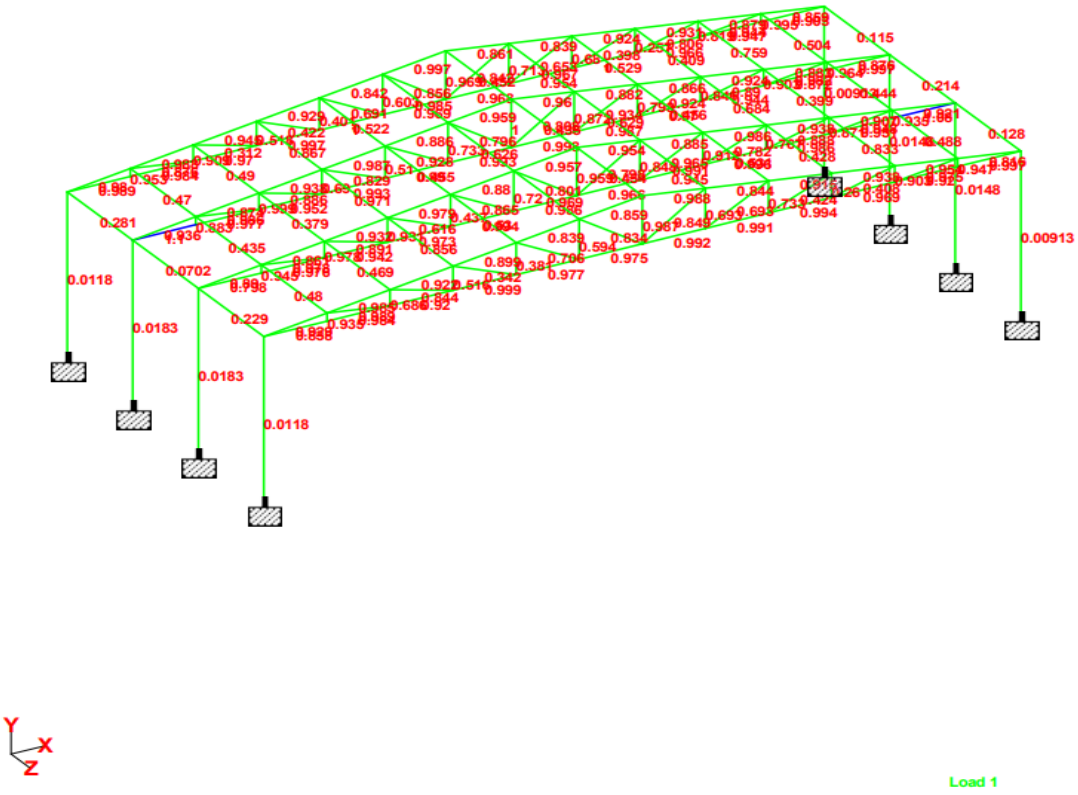


Fig 31. Interaction Ratio

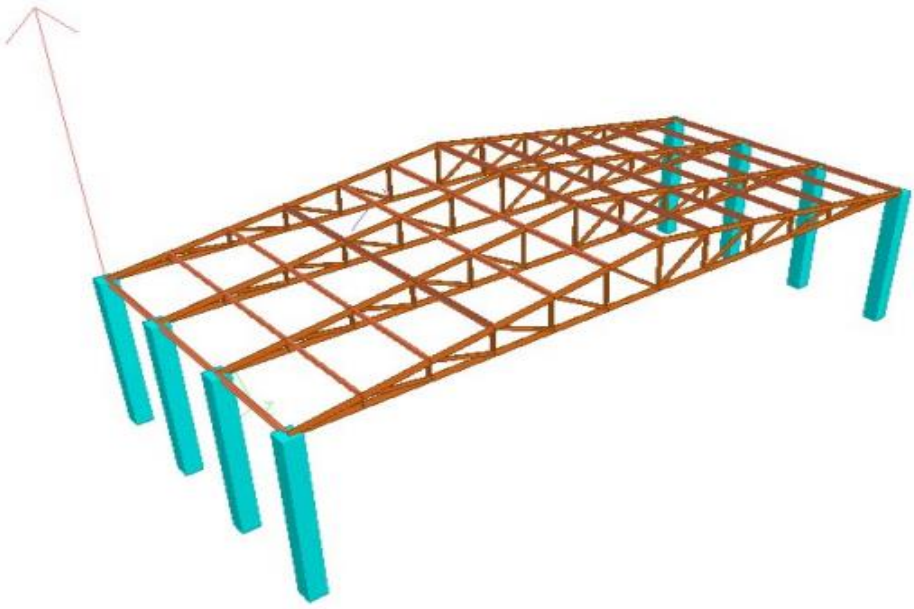


Fig 32. 3D rendered view

3.1.4 Manual Calculations
Design Of Tension Member

1. Gross section yielding

Tdg = (Ag * fy) /γm0

where,

Ag - gross area of cross-section,

fy - yield stress of the material, and

γm0 - partial safety factor for failure in tension by yielding = 1.1 (refer to Table 5 of IS 800).

2. Net Section fracture

For plates and threaded rods, Tdn = 0.9 * An * fu / γm1

where,

γm1 - partial safety factor for failure at ultimate stress=1.25 (refer to Table 5 of IS 800: 2007),

fu - ultimate stress of the material,

An - the net effective area of the member

For other tension members, Tdn = ∝ * An * fu / γm1

where ,

γm1 - partial safety factor for failure at ultimate stress=1.25 (refer to Table 5 of IS 800:2007)

fu - ultimate stress of the material,

An - the net root area at the threaded section.

∝ - 0.6 for one or two bolts,

0.7 for three bolts

0.8 for four or more bolts along length in the end connection or equivalent weld length.

Design Strength in Tension of a Single Angles:

$$Tdn = (0.9 * Anc * fu / \gamma m1) + (\mathbf{\beta * Ago * fy} / \gamma m0),$$

where,

$$\beta = 1.4 - 0.076 * (w/t) * (fy/fu) * (bs/Lc) \leq ((fu*\gamma m0) / (fy*\gamma m1)) \text{ and } \geq 0.7,$$

where,

w - outstand leg width,

bs - shear lag width

Lc - length of the end connection that is the distance between the outermost bolts in the end joint measured along the load direction or length of the weld along the load direction

An - net area of the total cross-section,

Anc - the net area of the connected leg,

Ago - the gross area of the outstanding leg,

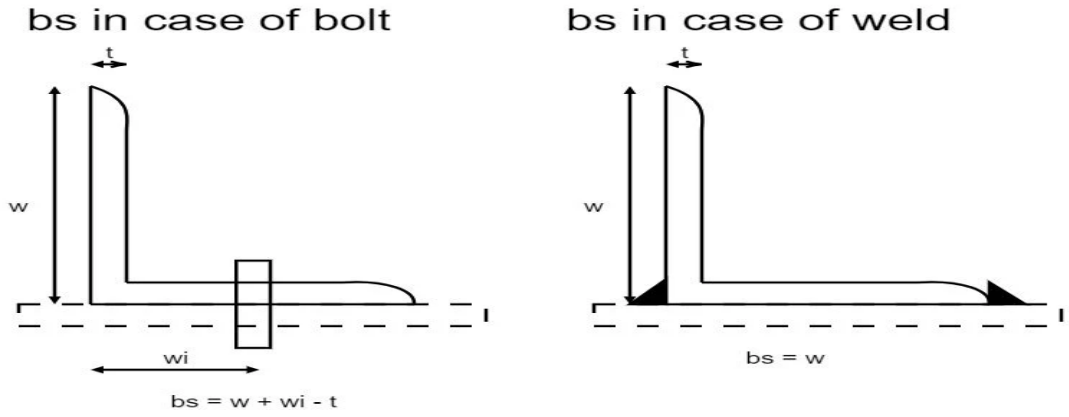
t - thickness of the leg

γm1 - partial safety factor for failure at ultimate stress = 1.25 (refer to Table 5 of IS 800:2 007),

γm0 - partial safety factor for failure governed by yielding = 1.1 (refer to Table 5 of IS 800: 2007),

fu - ultimate stress of the material, and

fy - yield strength of the material.



3.Block Shear Failure

1. Bolted Connection

The block shear strength Tdb of connection shall be taken as smaller of,

Tdb = [((Avg * fy) / (√3 * γm0)) + ((0.9 * Atn * fu)/ γm1)] or

Tdb = [(0.9 * Avn * fu) / (√3 * γm1) + ((Atg * fy)/ γm0)]

where,

Avg, Avn - minimum gross and net area in shear along bolt line parallel to external force,

Atg, Atn - minimum gross and net area in tension from the bolt hole to the toe of the angle, end bolt line, perpendicular to the line of the force,

fu, fy - ultimate and yield stress of the material respectively,

γm1 - partial safety factor for failure at ultimate stress = 1.25 (refer to Table 5 of IS 800: 2007), and

γm0 - partial safety factor for failure governed by yielding = 1.1 (refer to Table 5 of IS 800: 2007).

2.Welded Connection

The block shear strength, Tdb shall be checked for welded end connections by taking an appropriate section in the member around the end weld, which can shear off as a block.

Example1: Design Single equal angle tension member connected to a 10mm thick gusset plate to carry a factored load of 150 kN using bolted connection. Use 20mm diameter bolt of 4.6 grade.

Given: Load =150 kN

Thickness of gusset plate=10mm

Ultimate strength of material, fu =410MPa

Yield strength of material fy =250MPa

Ultimate strength of bolt, fub=400MPa

Yield strength of bolt, fyb =240MPa

Diameter of bolt, db=20mm

Diameter of hole, dh=22mm

γm0=1.1

γmb=1.25

γm1=1.25

Step 1: Calculation of number of bolts

Anb=π x 20^2 x 0.78/4= 245.044 mm^2

Asb= π x 20^2=314.16 mm^2

Shear Capacity of bolt:

n_n=1 n_s=0

Vnsb = fub (n_n x Anb + n_s x Asb) /√3= 400 (1 x 245.044 + 0) /√3= 56.59kN

Vdsb= Vnsb /1.25= 56.59/1.25= 45.27kN

Bearing Capacity of bolt:

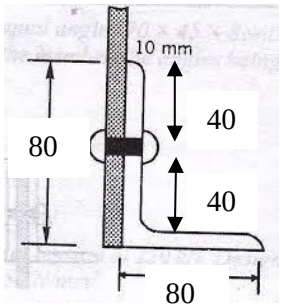
Kb= e/3d_o= 40/ 3 x 22= 0.56

$Kb= (P/3d_0)-0.25= 50/ (3 \times 22)-0.25=0.5$

$Kb=f_{ub}/f_u= 400/410=0.97$

Kb=1

Kb is lesser of all the above values i.e., Kb=0.5



$Vnpb=2.5 \times Kb \times d \times t \times f_{ub} = 2.5 \times 0.5 \times 20 \times 10 \times 400= 100kN$

Vdpb= Vnpb/1.25=100/1.25=80kN.

Bolt value= 45.27kN

Number of bolts= Factored load/ bolt value= 150/45.27=3.3≈4.

Provide 4-20mm diameter bolts of grade 4.6 in one line at a pitch of 50mm and edge distance of 40mm.

Step 2: Obtain the net area, An, required to carry the design load Tu from the equation using the ultimate stress.

$Tu = fu\ An / \gamma m1$

Here, Tu = 150 kN, fu = 410 MPa, and $\gamma m1$ = 1.25 Therefore, An = 571.646 mm^2

Step 3: Obtain the gross area, Ag, required to carry the design load Tu from the equation using the yield stress.

$$Tu = fy\ Ag /\gamma m0$$

Here, Tu = 150 kN, fy = 250 MPa, and $\gamma m0$ = 1.10 Therefore, Ag = 660 mm^2

Step 4: From steps 1 and 2, Required gross area Ag required = 660 mm^2 (max. value)

From IS handbook, Select an angle 80 x 80x 10mm

Ag = 1505 mm^2 (> 660 mm^2)

Step 5: calculation of net area of connected leg and outstanding leg

net area of connected leg, Anc = (80-22-5)10=530 mm^2

gross area of outstanding leg, Ago = (80-5)10=750 mm^2

Step 6: The design strength Tdg of plate limited to the yielding of gross cross-section Ag is given by

$T_{dg} = fy\ Ag /\gamma m0$

Here fy = 250 MPa, Ag = 1505 mm^2 and $\gamma m0$ = 1.10 Hence Tdg = 342.045kN > 150kN.

Hence safe

Step 7: The design strength Tdn of angle governed by rupture of net cross-sectional area

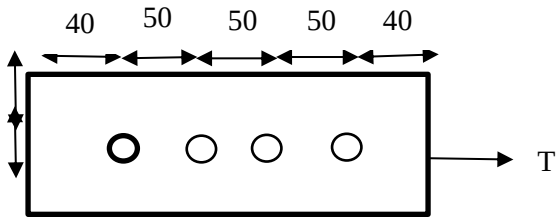
An is given by

Tdn =0.9 fu Anc / γm1 +β Ago fy /γm0

β = 1.4 – 0.076 (w/t) (fy /fu) (bs /Lc) ≤ (fu γm0 / fy γm1)

Here fu = 410 MPa, fy = 250 MPa, γm1 = 1.25, and γm0 = 1.10 w = 80 mm, t =10mm, bs = (40 + 80 – 10) = 110 mm, Lc = 3 x 50= 150 . Hence, β = 1.128. Since 0.7 ≤ β ≤ 1.44, β = 1.128

Hence, Tdn = 348.73kN > 150kN. Hence safe



Step 8: The design strength Tdg of angle governed by block shear shall be taken as smaller of

Tdb1 = (Avg fy / (3 γm0) + 0.9 Atn fu /γm1)

Tdb2 = (0.9 Avn fu / (3 γm1) + Atg fy /γm0).

Assuming an edge distance of 40 mm

Atg = 40x 10 = 400 mm^2

Atn = (40 – 22/2) x 10 = 290 mm^2

Avg = (3x50+40)10=1990 mm^2

Avn = (3x50+40-(3.5x22)) =1130 mm^2

Therefore, Tdb1 = $(Avg \times f_y)/ (\sqrt{3} \times \gamma m0) + (0.9 \times Atn \times f_u)/ \gamma m1$ = 310.545kN

Tdb2 = $(0.9 \times Avg \times f_u)/(\sqrt{3} \times \gamma m1) + (Atn \times f_y)/ \gamma m0$ =283.5 kN

Hence Tdb = 283.5 kN >150 kN. Hence safe.

Design Of Compression Member

Example 1: Design a double angle discontinuous strut to carry a load of 400KN. The length of the strut is 3m and gusset plate used for the connection is 10mm thick. Use 20mm diameter of the bolt for the connection.

Given: Load=400kN

Thickness of gusset plate=10mm

Length of the strut=3m

Ultimate strength of material, fu =410MPa

Yield strength of material fy =250MPa

Ultimate strength of bolt, fub=400MPa

Yield strength of bolt, fyb =240MPa

Diameter of bolt, db=20mm

Diameter of hole, dh=22mm

γm0=1.1

γmb=1.25

γm1=1.25

Step 1: Calculation of number of bolts

Anb=π x 20^2 x 0.78/4= 245.044 mm^2

Asb= π x 20^2=314.16 mm^2

Shear Capacity of bolt:

n_n=1 n_s=0

Vnsb = fub (n_n x Anb + n_s x Asb) /$\sqrt{3}$= 400 (1 x 245.044 + 0) /$\sqrt{3}$= 56.59kN

Vdsb= Vnsb /1.25= 56.59/1.25= 45.27kN

Bearing Capacity of bolt:

Kb= e/3d_o= 40/ 3 x 22= 0.56

Kb= (P/3d_0)-0.25= 50/ (3 x 22)-0.25=0.5

Kb=f_{ub}/f_u= 400/410=0.97

Kb=1

Kb is lesser of all the above values i.e., Kb=0.5

Vnpb=2.5 x Kb x d x t x f_{ub} = 2.5 x 0.5 x 20 x 10 x 400= 100kN

Vdpb= Vnpb/1.25=100/1.25=80kN.

Double angle bolt value= 2 x 45.27kN=84.5kN

Number of bolts= Factored load/ bolt value= 400/84.5=4.73≈5

Provide 5-20mm diameter bolts of grade 4.6 at a pitch of 50mm and edge distance of 40mm.

Step 2: Assume the design stress for angle as 90 MPa

Step 3: Calculation of area of member

Load on each angle =400/2=200kN

Area= P/fcd= (400 x 1000)/90=4444.44 mm^2

From IS handbook, take ISA 200 x 150 x 50 mm, the relevant properties are:

A=5025 mm^2

Cxx=62mm

Cyy=37.2

Ixx=2005.6 x 10^4 mm^4

Iyy=969.9 x 10^4 mm^4

rxx = 63.2mm

Step 4: Iyy`= Iyy+Ah^2

h= Cyy+ (thickness of the gusset/2) = 37.2+(10/2) =42.2mm

Iyy`=2[969.9 x 10^4 +5025(42.2^2)] = 3729.54 x 10^4 mm^4>2005.6 x 10^4 mm^4

Iyy>Ixx, Hence Ixx is governing.

Step 5: Calculation of effective length:

From Table 11.2 for discontinuous type double angles placed back-to-back on the opposite side of gusset plate is given as 0.7 to 0.85L. Take effective length as 0.85L

KL=0.85L = 0.85 x 3000= 2550mm

Step 6: Calculation of effective slenderness ratio:

λ=KL/rmin= 2550/63.2 = 40.348 < 180 which is safe.

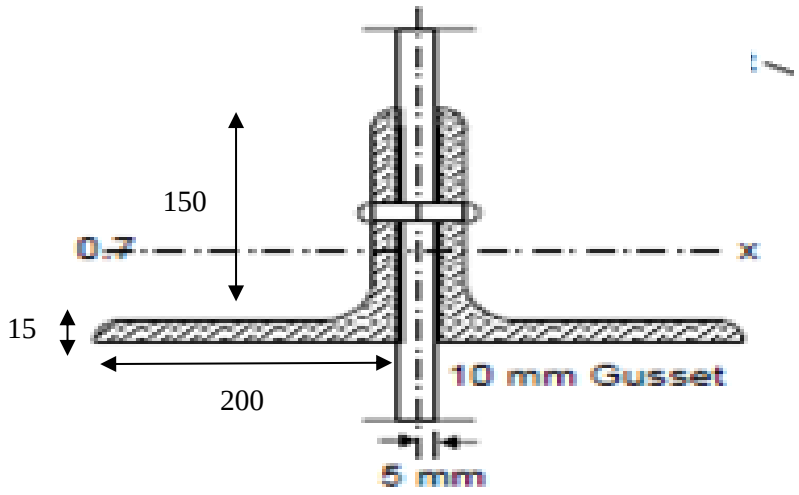
For KL/r= 40.348, fy=250Mpa and Buckling curve ‘c’ the design compressive stress from IS 800- 2007 Table 9(c),

fcd = 197.478 N/mm^2

Step 7: Calculation of design compressive strength

Pd=Ae x fcd

Pd= 197.478 * 5025 = 992.32kN > 400kN . Hence Safe.



Example 2: Calculate the Design compressive load for a stanchion 250 @ 365.913 N/m, 5m high. The column is restrained in direction and position at both the ends.

Given: Length of the strut=3m

Ultimate strength of material, fu =410MPa

Yield strength of material fy =250MPa

Condition: Column is restrained in direction and position at both the ends, K=0.65

The properties of ISMB 250 @ 365.913 N/m

A=4755mm^2

h=250mm

b=125mm

tf=12.5mm

tw=6.9mm

Ixx=5131.6 x 10^4 mm^4

Iyy=334.5 x 10^4 mm^4

rzz=103.9mm

ryy=26.5mm

h/bf=250/125=2 > 1.2

tf=12.5mm $\leq$ 40mm

Hence for above conditions from Table 10 of IS 800-2007, The buckling curve along z-z axis will be curve 'a' that about y-y axis will be curve 'b'

(i) About y-y axis

Effective slenderness ratio, λ= KL/ryy= (0.65 x 5000)/26.5=122.64

For λ=122.64, fy=250MPa and buckling curve 'b', The design compressive stress from table 9 (b),

fcd = 88.875 MPa

Pd= 4755 x 88.875 = 422.6 kN

(ii) About z-z axis

Effective slenderness ratio, λ= KL/rzz= (0.65 x 5000)/103.9=31.28

For λ=31.28, fy=250MPa and buckling curve 'a', The design compressive stress from table 9 (a),

fcd = 219.104 MPa

Pd= 4755 x 219.104 = 1041.83 kN

Hence, Design Compressive strength is 422.6 kN

CHAPTER 4

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BVVS

DEPARTMENT OF BIOTECHNOLOGY

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOTE-587102 KARNATAKA

[TEQIP lead Institute, Govt. Aided AICTE Recognized Affiliated to VTU Belgavi]

CERTIFICATE

This is to certify that the **"Industrial Internship Report"** submitted by Ms. Ritu B Nikam, bearing USN: 2BA20FBT03, in partial fulfillment of M.Tech Food Biotechnology, at Department of Biotechnology, Basaveshwar Engineering College (A), Bagalkote, affiliated to Visveshvarayya Technological University, Belgavi during the academic year 2021-2022. It is certified that all corrections, suggestions indicated during Internal Assessment have been incorporated in the report.

Dr. G B Megeri
Coordinator

Dr. Bharathi S Meti
H O D

Examiners

Signature with date

1) Dr G B Megeri _____ 14/3

2) Dr. Bharati S Meti _____ 14/3/22

3) _____ _____

CHAPTER 1

ABOUT THE COMPANY

1.1 HISTORY:

Radiant Research Services Private Limited is a Private company incorporated on 17 November 2009. It is classified as Non-Government Company and is registered at Registrar of Companies, Bangalore. It is involved in Research and experimental development on natural sciences and engineering (NSE). [This class includes systematic creative work in the fields of research and development in natural sciences, medical sciences, agriculture and engineering & technology]. Radiant Research Services private limited is a Contract research services company which supports the drug discovery, product development, and analytical R&D and Clinical research activities of Pharmaceutical, Cosmetic, Nutraceutical and Herbal industries.

Radiant Research equipped with State-of-the-art facilities in cell biology, microbiology, molecular biology, phytochemistry and pharmacology along with research expertise to offer end-to-end customised and cost-effective research services. Drug Testing Lab has been approved by the Ministry of AYUSH, New Delhi for carrying out tests on drugs, formulations and raw materials used in the manufacture of AYUSH category products. Animal facility has been registered by CPCSEA, MOEF, New Delhi to breed and experiment on animals.

Fig 1.1.1- Logo of Radiant Research Services Private Limited

1.2 CORE VALUES:

Radiant Research is an ISO 9001:2015 organization and committed to implement and improve in all aspects of its operations to deliver quality and efficient services to our customers. We ensure that through established standards and measurements, the level of quality matches or exceeds our customer expectation. To emerge as one-point contact for every need of the client by offering cost effective, time bound and value-added customized services in the area of contract research and to become a leader in Indian CRO market. To become the best contract research partner for the Pharma, cosmetic, Nutraceuticals, Ayurveda and herbal companies by supporting end to end solutions in their research by providing superior performance. Delivering customer satisfaction by listening to and exceeding customer expectations. Adding value for our customers through our services. Seeking innovative solutions to help our customers achieve their goals.

1.3 ACCREDITATION

Radiant research services are accredited by the following – Ministry of AYUSH, NORWEGIAN ACCREDITATION, MOEF and National Accreditation Board For Testing And Calibration Laboratories.

Fig 1.3.1 - Accreditation Bodies

National Accreditation Board for Testing and Calibration Laboratories (NABL)

The National Accreditation Board for Testing and Calibration Laboratories (NABL) undertakes the assessment and accreditation of Testing and Calibration Laboratories, in accordance with the international standard ISO / IEC 17025 and ISO 15189.

Accreditation areas

Testing: Biological, Chemical, Electrical, Electronics, Fluid-Flow, Mechanical, Non-Destr -uctive Testing, Photometry, Radiological, Thermal, Forensic, Medical

Calibration: Electro-Technical, Mechanical, Fluid flow, Thermal & Optical, Radiologicals

1.4 ORGANIZATION STRUCTURE:

Radiant Research's research facility houses Biotechnology platforms like Cell Biology, Molecular Biology, Microbiology, Phytochemistry and well-designed animal house to offer a wide range of preclinical services.

Salient features of the facility include:

- Well-equipped *In vitro* Cell biology, Molecular Biology and Microbiology laboratories.
- Well-equipped AYUSH certified Drug Testing Laboratory supported by separate microbiology lab, analytical facility.
- Standardized protocols for cosmetic testing with suitable equipment to simulate the natural conditions.
- Animal house as per CPCSEA standards with efficient AHU, separate breeding and experimentation areas with dedicated in-house biochemistry and histology facility.
- Entire facility is backed up with UPS and DG power.

Fig. 1.41 Lab Corridor

Fig. 1.42 Drug Testing Lab

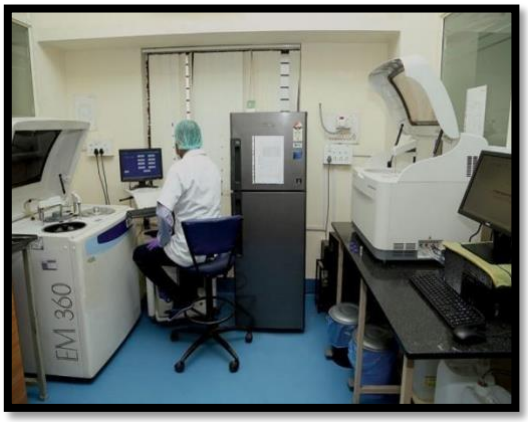

Fig.1.43 Phytochemistry Lab

Fig.1.44 Cell Biology

Fig.1.45 Microbiology Lab

Fig.1.46 Molecular Biology Lab

Fig.1.47 Animal House

Fig.1.48 Rabbit House

1.5 SERVICES

Herbal and Ayush: Radiant Research has an experience of working with different research teams to develop and evaluate the herbal and Ayurvedic products for the regulatory submissions within specific time lines. Radiant Research, an ISO 9001:2008 certified and Department of AYUSH approved facility offers time bound quality testing services for the raw material and finished products.

Nutraceutical: With thorough knowledge of recent regulations on nutraceuticals in the domestic and international market, at Radiant Research according to client's requirement with respect to product's efficacy and safety. At Radiant Research, optimizes the standard protocols to evaluate the Nutraceutical products through the preclinical and clinical research services to confirm the efficacy, safety and quality of raw materials and formulations.

Cosmetics/Personal Care: Radiant Research is committed towards cruelty free testing for cosmetics and has established in vitro cell based testing facility to provide non animal testing services. At Radiant Research, we have established three-dimensional human skin equivalent models such as epiderm, episkin, skin ethic and Start-M to evaluate the efficacy, safety and permeation/absorption of cosmetic ingredients and cosmetics.

Pharmaceutical: Radiant Research has successfully partnered with many clients in their research and development programmes starting from lead identification, optimization of leads to increase the affinity, selectivity, efficacy/potency, metabolic stability, oral bioavailability using various research platforms, followed by developing a suitable formulation for clinical trials to evaluate its safety and efficacy in humans

Drug Testing Lab: Radiant Research is committed towards continuous improvement of quality of service and customer satisfaction to provide quality products and to be an integral part in improving the standards of human health. At Radiant Research, offer quality and time bound testing services ranging from physicochemical to biological safety profiling as per national and international regulations.

Preclinical Research: Radiant Research with its strong background of Preclinical studies offer both in vitro (cell/microbe based) and In vivo (animal based) customised research services to evaluate the efficacy and safety to lead drugs/formulations before proceeding for clinical trials.

Clinical Research: Radiant Research conducts Phases 1 to 4 clinical trials for Pharmaceutical, Nutraceutical, Herbal and Ayurvedic companies, whilst maintaining the highest standards of ethics, quality and confidentiality.

Equipped with,

- Full range of in-house sops and SOP writing to adapt to sponsor/protocol requirements.
- Integrated Project management system to maintain highest ethical standards and safety of the subjects
- Dedicated and experienced clinical research team
- Fully integrated clinical trial laboratory and coordination with other laboratories
- Proactive approach at each stage of the trial to address the client's requirements

Key services include:

- Feasibility & Regulatory approvals.
- Medical Writing
- Project Management
- Clinical trial and Site management
- Clinical Trial Monitoring
- Clinical Data Management
- Biostatistics

Herbal and Ayush provides:

Pharmacognostic Services

- Physicochemical analysis (ash values, moisture content, minerals content, extractive values etc)
- Fluorescence analysis
- Microscopic study (TS, powder study, vein lets, vein termination, stomatal index etc)
- HPTLC and HPLC fingerprinting.

Phytochemistry Services

- Extraction of raw materials with different methods
- Phytochemical analysis
- Isolation and characterization of phytoconstituents
- Bioassay guided isolation and characterization for a specific activity (diabetes, antioxidants, antimicrobial etc).

Radiant Research provides clinical, preclinical, quality control, microbial analysis services:

Clinical services include:

- Feasibility & Regulatory approvals.
- Medical Writing
- Project Management
- Clinical trial and Site management
- Clinical Trial Monitoring
- Clinical Data Management
- Biostatistics

Preclinical

Efficacy studies (In vitro & In vitro) for cancer, Antioxidant, Diabetes, immunomodulatory & Inflammation, Hepatoprotective, Obesity, Anti-infectives, Anti-aging, Skin moisturizing, Hair growth/anti-hair fall. Toxicology includes: Acute oral Toxicity, Acute Dermal toxicity, Acute ocular toxicity, Acute inhalation toxicity, Repeat-Dose Toxicity Studies (Sub-acute/Subchronic/Chronic), Skin sensitization, Genotoxicity, AMES test (BRMT), Chromosomal aberration in CHO-K1 cells, Micronucleus assay, Histopathology

Quality Control

Physicochemical tests include determination of pH, moisture content analysis (LOD), Disintegration, Melting point, limit tests, titrations, viscosity measurements, thickness.

Microbial Analysis

It includes microbial analysis (TMC & TFC), most probable number (MPN), specific pathogen detection, water analysis, sterility test.

CHAPTER 2

ABOUT THE DEPARTMENT

DRUG TESTING LAB

2.1 Drug Testing Lab

Radiant Research, an ISO 9001:2008 certified facility for Quality Management System and one of the very few approved Drug Testing Lab by Ministry of AYUSH, New Delhi. Drug Testing Lab is one of the best in its class offering a complete range of quality control services to Herbal, Ayurvedic, Cosmetic, Nutraceutical and Pharmaceutical raw materials and finished products as per various pharmacopeial and formulary standards. Radiant Research is committed towards continuous improvement of quality of service and customer satisfaction to provide quality products and to be an integral part in improving the standards of human health. At Radiant Research, offer quality and time bound testing services ranging from physicochemical to biological safety profiling as per national and international regulations.

Physicochemical Tests

- Determination of pH
- Moisture Content Analysis (LOD)
- Disintegration
- Dissolution
- Melting point
- Marker analysis by HPLC
- Friability
- Hardness
- Bulk density & Tap Density
- Viscosity Measurements
- Determination Ash Value
- Weight Variation
- Sieve Analysis
- Refractive Index
- Thickness
- Limit Tests
- Titrations

2.1.1 TOOLS

1. **Disintegration Apparatus:** Introduce one tablet or capsules into each tube, add a disc to each tube. Suspend the assembly in the beaker containing the specified liquid and operate the apparatus for the specified time. Remove the assembly from the liquid. The disintegrating tablets or capsules pass the test if all tests have disintegrated.

Fig.2.1.1.1 Disintegration unit

2. **Water Bath Apparatus:** A water bath is laboratory equipment made from a container filled with heated water. It is used to incubate samples in water at a constant temperature over a long period of time. Used for warming of reagents, melting of substrates or incubation of cell cultures. For all water baths, it can be used up to 99.9 °C.

Fig.2.1.1.2 Water Bath

3. **Desiccator Apparatus:** Desiccators are sealable enclosures containing desiccants used for preserving moisture-sensitive items. A common use for desiccators is to protect chemicals which are hygroscopic or which react with water from humidity, example silica gels, $CaSO_4$, $MgSO_4$ etc.

Fig.2.1.1.3 Desiccator

4. **Muffle Furnace:** A muffle furnace or muffle oven is a furnace in which the subject material is isolated from the fuel and all of the products of combustion, including gases and flying ash. Heating element embedded on all four sides. Ambient temperature 1150°C.

Fig.2.1.1.4 Muffle Furnace

MICROBIOLOGY LABORATORY

2.2 Microbiology Lab

Radiant Research, an ISO 9001:2008 certified facility for Quality Management System and offers a complete range of Microbial analysis to Herbal, Ayurvedic, Cosmetic, Nutraceutical and Pharmaceutical raw materials and finished products as per various pharmacopeial and formulary standards.

Radiant Research is committed towards continuous improvement of quality of service and customer satisfaction to provide quality products and to be an integral part in improving the standards of human health.

At Radiant Research, offer quality and time bound testing services ranging from physicochemical to biological safety profiling as per national and international regulations.

Microbial analysis

- Total aerobic count
- Specific Pathogen detection
- Preservative efficacy testing (PET)
- Sterility testing
- Bacterial Endotoxin Test (BET)
- Water analysis
- Time kill assay
- Microbial Analysis (TMC & TFC)
- Most Probable Number (MPN)
- Microbiological assay of antibiotics.

2.2.1 TOOLS

1. **Autoclave:** Autoclaves are laboratory machines that heat their contents under heightened pressure conditions it is a moist heat sterilization method, temperature is 121°C, pressure 15 lbs, time 15-20 minutes for sterilization.

Fig.2.2.1.1 Autoclave

2. **Laminar Air Flow:** A laminar flow cabinet or tissue culture hood in which air is drawn through a HEPA filter and blown in a very smooth, laminar flow towards the user. The cabinet is usually made of stainless steel with no gaps or joints where spores might collect. Two types are Vertical Laminar air flow and Horizontal Laminar air flow. Laminar flow cabinets may have a UV-C germicidal lamp to sterilize the interior and contents before usage to prevent contamination of the experiment. Germicidal lamps are usually kept on for fifteen minutes to sterilize the interior before the cabinet is used. The light must be switched off when the cabinet is being used, to limit exposure to skin and eyes as stray ultraviolet light emissions can cause cancer and cataracts.

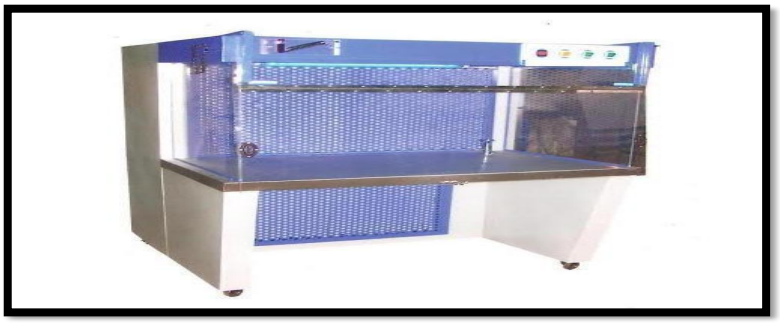

Fig.2.2.1.2 Laminar Air Flow

MOLECULAR BIOLOGY LABORATORY

2.3 Molecular Biology Lab

Radiant Research, an ISO 9001:2008 certified facility for Quality Management System and offers a complete range of Molecular Biology laboratory for analysis of Herbal, Ayurvedic, Cosmetic, Nutraceutical and Pharmaceutical raw materials and finished products as per various pharmacopeial and formulary standards. Radiant Research is committed towards continuous improvement of quality of service and customer satisfaction to provide quality products and to be an integral part in improving the standards of human health. At Radiant Research, offer quality and time bound testing services ranging from physicochemical to biological safety profiling as per national and international regulations.

Molecular Biology tests:

- Sandwich ELISA
- PCR
- Gel Electrophoresis
- ATP Synthesis

2.3.1 TOOLS

1. Gel Documentation: Gel documentation also know as Gel doc system, gel image system. It is widely used in molecular biology laboratory for imaging and documentation of nucleic acid, protein polyacrylamide or agarose gels typically stained with ethidium bromide or fluorophores such as SYBR green. Gel doc is composed of ultraviolet light transilluminator a hood to shield external light source and CCTV camera for image capturing.

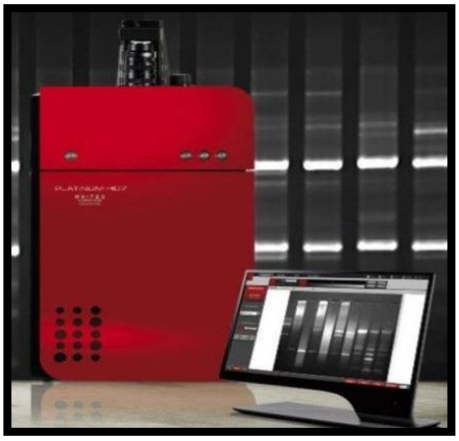

Fig.2.3.1.1 Gel documentation

PRE-CLINICAL LABORATORY

2.3 Pre-clinical Lab

Radiant Research with its strong background of Preclinical studies offers both in vitro (cell/microbe based) and In vivo (animal based) customised research services to evaluate the efficacy and safety of lead drugs/formulations before proceeding for clinical trials. At Radiant Research, we offer customized preclinical efficacy and toxicology services to Pharma, Herbal, Ayurvedic, nutraceutical and cosmetic industry and have become favourite one stop destination for all drug discovery requirements.

CANCER: IN VITRO

- Cytotoxicity assay by MTT/SRB/Trypan blue
- Clonogenic assay.
- Apoptosis – Nuclear staining with DAPI
- Alkylating activity assay
- TUNEL assay
- Endonuclease assay
- Cancer specific gene expression analysis
- (P53, BCl2, Capsase 3, VEGF, cyclin D1, cyclin B1, STAT3 etc.)

In vivo

- DLA/EAC induced ascetic tumor model in mice
- DLA induced solid tumor model in mice

COSMETIC RESEARCH

- Skin Lightening
- Sun Protection Factor (SPF)
- Anti-aging
- Skin tightening
- Psoriasis
- Scar/wound healing
- Anti-acne
- Anti-Dandruff
- Deodorant
- Skin Moisturizing
- Skin pigmentation
- Hair growth/anti-hair fall
- Dermal permeation/absorption using EpiskinTM / EpidermTM/ Porcine skin/Start-M

SAFETY/TOXCITY

- 3T3 NRU phototoxicity (Skin irritation)
- Acute Dermal toxicity
- Acute ocular toxicity
- Acute inhalation toxicity
- Skin sensitization
- Genotoxicity
- AMES test (BRMT)

CHAPTER 3

LEARNING OBJECTIVES/ INTERNSHIP OBJECTIVES

- To get exposure to the working environment.
- To improve equipment handling and Laboratory skills.
- To asses the importance of quality testing.

CHAPTER 4

ACTIVITIES PERFORMED

DRUG TESTING LAB

Sample: Herbal Drug

4.1 Determination of total ash

1) Take the given Herbal Medicine and powder it in a mixer jar.
2) Weigh accurately about 2-3 grams of this powder using electronic balance.
3) Transfer the weighed powder in a dried & sterilized crucible.
4) Then heat it at 450°C in Muffle's Furnace for 3 hours.
5) Cool the sample by keeping it in a Desiccator and once again weigh the sample using electronic balance.
6) Using the formula calculate the Total ash for the given sample.

Calculation: $\% \text{ total ash} = \frac{\text{weight of ash}}{\text{weight of sample}} \times 100$

Fig4.1.1 Total Ash

4.2 Determination of moisture content:

1) Take the sample, grind it in a mixer jar & keep it in hot air oven for 3-4 hours.
2) Take the powdered sample in a flask.
3) Mix with 100ml water and keep it for 24 hours without disturbing.
4) Then carefully filter the solvent using whatman filter paper.
5) Then pour the filtered sample to a a China dish.
6) Keep the China dish in water bath for 40 – 45 minutes and leave it for complete drying at 90°C temperature

Calculation: Moisture % by mass = $\frac{M-M1}{M} * 100$

Where; M = mass of the material taken for the test, in g
M1 = Mass of the material after drying in g.

Fig4.2.1 Boiling Water Bath

4.3 Determination of Reducing, Non reducing and Total Reducing sugar

Sample preparation

1) Weigh accurately 25 grams of sample using electronic balance.
2) Add 40ml of water and mix it thoroughly.
3) Add 5ml of Clarifying agent I and II each and make total volume up to 100ml with water.
4) Filter using filter paper(Whattman paper).

Reducing Sugar

1) Take 25ml of sample in Burette.
2) In conical flask add 5ml of each Fehlings A and B solution.

3) Add 2 drops of Methylene blue along with ceramic pieces.
4) Titrate against sample on heating mantle.
5) Burette reading recorded.

Total reducing sugar

1) Take 25ml of sample, add 5ml of 1:1 HCL to it.
2) It is heated for 15mins at 40°C.
3) Then it cooled at Room temperature and 2 drops of phenopthaline indicator is added to it.
4) It is then netralized with 1N NaOH simultaneously pH is measured to 7.
5) Then make it upto 100ml total volume.
6) In conical flask add 5ml of Fehling solution A and B along with methylene blue.
7) Titrate the sample and note down burette readings.

Calculations: Determination of Reducing sugar

1) Weight of the sample(w)
2) Burette reading(B.R)
3) Reducing sugar content(%)

$$x = \frac{0.025*17.3*100*100}{B.R*w}$$

x= _____%

- ## Determination of Total Reducing sugar

1) Weight of the sample(w)
2) Burette reading(B.R)
3) Non reducing sugar(%)

$$y = \frac{0.0025*17.3*2*100*100}{B.R*w}$$

y = ____%

- ## Determination of Non-reducing sugar

$$z = y-x$$

Total reducing sugar = z*0.95
= ____%

Total sugar(%)= % Reducing sugar+ %Total reducing sugar

4.4 Procedure to determine water solubility of the sample

Day 1

1) Take 5gms of sample in conical flask.
2) Add 100 ml of water to it.
3) Keep it for 24hrs overnight.
4) Filter using filter paper.

Day 2

1) Crucibles are kept in hot air oven for 5 mins at 105°C and cooled in desicator.
2) Empty weight of crucibles are noted down.
3) 25ml of filtered sample is taken in crucibles.
4) Then it is heated in hot air oven for 2 hr. And cooled in desicator.
5) Weigh the crucibles.

4.5 Procedure to determine alcohol solubility of the sample

Day 1

1) Take 5gms of sample in conical flask.
2) Add 100 ml of alcohol to it.
3) Keep it for 24hrs overnight.
4) Filter using filter paper.

Day 2

1) Crucibles are kept in hot air oven for 5 mins at 105°C and cooled in desicator.
2) Empty weight of crucibles are noted down.
3) 25ml of filtered sample is taken in crucibles.
4) Then it is heated in hot air oven for 2 hr. And cooled in desicator.
5) Weigh the crucibles.

4.6 Procedure to determine acid value of the sample

1) Weigh 10gm of sample in 250 ml flask.
2) Add 50ml of mixture of equal volumes of alcohol and solvent diethyl ether.
3) It is now neutralized with 1ml of phenophthalein.

4) Heat the mixture on water bath until the substance has completely melted.
5) Titrate it against 0.1N KOH until pink colour persists for 15 seconds.
6) Note the number of ml required.

Calculation:

$$\text{Acid value} = \frac{a*0.00561*1000}{w}$$

Where,
a = Number of 0.1 N KOH required
w = weight of the sample

4.7 Procedure to determine the iodine value of the sample

1) Weigh 2gm of sample in dry Iodine flask.
2) Add 10ml of carbon tetrachloride to it.
3) Add 20ml of iodine monochloride solution and insert the stopper.
4) Previously moistened with solution of potassium iodine and allow to stand in a dark place at temperature at 17°C for 30 mins.
5) Add 15ml of solution of potassium iodine and 100ml of water, shake and titrate with 0.1N sodium thiosulphate using starch as indicator.
6) Note the number of ml required

Calculation:

$$\text{Iodine value} = \frac{(b-a)*0.01269*100}{w}$$

Where,
b = ml of thiosulphate used in blank experiment
a = ml of thiosulphate used in determination
w = weight of the sample

4.8 DETERMINATION OF TOTAL RESIDUE

1) Take the given Herbal cream or powder in a china dish(washed, dried & pre-weighed).
2) Weigh accurately about 2-3 grams of this cream/powder using electronic balance.
3) Transfer the weighed powder in a dried & sterilized china dish.
4) Then heat it in hot air oven for 3 hours.
5) Cool the sample by keeping it in a desiccator and once again weigh the sample using electronic balance.
6) Using the formula calculate the Total residue for the given sample.

Calculation: (% total residue = (Final weight-Empty weight / weight of sample) × 100)

4.9 DETERMINATION OF TOTAL FATTY MATTER

1) Take the given Herbal cream or powder in a china dish(washed, dried & pre-weighed).
2) Weigh accurately about 2-3 grams of this cream/powder using electronic balance.
3) Transfer the weighed powder in a dried & sterilized china dish.
4) Then heat it in 'Hot air oven' for 3 hours.
5) Cool the sample by keeping it in a Desiccator and once again weigh the sample using electronic balance.
6) After drying, add 5-10ml of acetone to the sample
7) Mix thoroughly the sample(water droplets trapped in oil are evaporated)
8) Keep in hot air oven and measure the value.

Calculation: $100x \frac{M1}{M2}$

4.10 DETERMINATION OF SAPONIFICATION VALUE

1) Weigh 2 g of sample, to the nearest 0.01 g, into a 300-niL Erlenmeyer flask.
2) Using a pipet, add 25 n1L of 0.5 N ethanolic potassium hydroxide.
3) Reflux for 60 minutes.
4) Titrate between 60 and 70ºC with 0.5 N hydrochloric acid using phenolphthalein indicator or an automatic titrator.
5) Run a blank in the same manner.

Calculation: Saponification value = $\frac{(b-a) \times 0.02805 \times 1000}{\text{weight of sample}}$

4.11 DETERMINATION OF SPECIFIC GRAVITY

1) Clean and dry the density bottle
2) Weigh the empty bottle with stopper (W_1)
3) Take about 10 to 20 gm of oven soil sample which is cooled in a desiccator.
4) Transfer it to the bottle. Find the weight of the bottle and soil (W_2).
5) Put 10ml of distilled water in the bottle to allow the soil to soak completely.
6) Leave it for about 2 hours.
7) Again fill the bottle completely with distilled water put the stopper and keep the

bottle under constant temperature water baths (T_x^0).

8) Take the bottle outside and wipe it clean and dry note. Now determine the weight of the bottle and the contents (W_3).

9) Now empty the bottle and thoroughly clean it. Fill the bottle with only disttiled water and weigh it. Let it be W_4 at temperature (T_x^0 C).

10) Repeat the same process for 2 to 3 times, to take the average reading of it.

Calculation : SPECIFIC GRAVITY = $\frac{[(D+S) - (E)]}{[(D+W) - (E)]}$

4.12 DETERMINATION OF VISCOSITY

1) Clean the viscometer by the water and ethanol and dry it.
2) Put a certain amount of liquid in the large bulge viscometer and pull it by pipette until the small bulge is full.
3) Put viscometer vertically in the water bath at the desired temperature.
4) Let the liquid to flow through the capillary tube with run time when the liquid reaches the mark shown on the viscometer and then stopped time when the liquid reaches the bottom mark.
5) Repeat the experiment and record the results (take average of results).
6) Repeat the experiment to other liquids.
7) Change the temperature and calculate the

Calculation : Weight of sample(A) = (D+S)

Empty dish(B)

Volume of bottle (C) = 25

Density of sample (D) = A-B/C

4.13 PRE-CLINICAL LABORATORY

MICE:

- Normal temperature: 37.4 °C
- Weight – weaning: 7g, adults (25-28g)
- Pulse rate: 120
- Estrous Cycle: 4-5 days
- Gestation period: 19-21 days
- Weaning age: 19-21 days
- Mating age: 6-8 weeks
- Room temperature: 20-21
- Humidity: 50-60%
- Dose given: 28 days
- Sacrifice: 45 days

HANDLING:

- Restrain a mouse, gently grasp it around the shoulder.
- Place the thumb under the mandible, to prevent bites.
- Hind limb is supported with other hand.

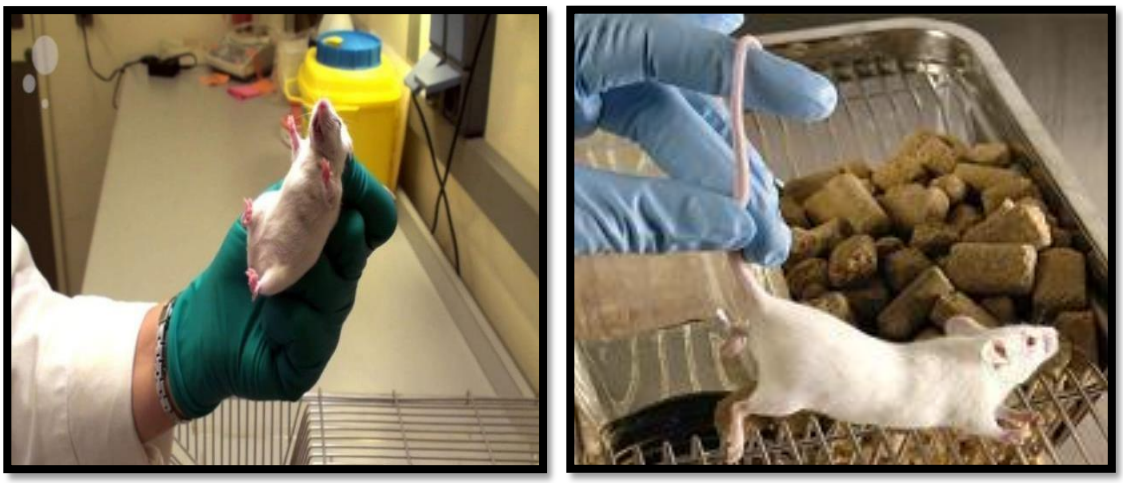

Fig4.13.1- Handling of animals

4.14 MICROBIOLOGY LABORATORY

Media Used: SDA(Sabouraud Dextrose Agar), SCDA(Soyabean Casein Digest Agar)

Media Preparation:

1) Accurately weigh the media base by electronic balance.
2) Transfer the weighed sample into bottle/flask.
3) Add distilled water to the flask, for making the correct volume.
4) Flask top/bottle should be covered by Cap/aluminum foil to prevent contamination.
5) For sterilization Autoclave should be used.

TAMC & TYMC:

Procedure:

1) Use 12 test tubes, 9 containing 9 ml of SCDA medium each and 3 containing 10 ml of the same medium each for control.
2) Prepare dilutions using 9 test tubes.
3) First add 1 ml of the test fluid to each of 3 test tubes & mix to make 10 times dilutions (100 ul).
4) Second add 1 ml of each of the 10 times dilutions to each of another 3 test tubes and mix to make 100 times dilutions (10 ul).
5) Third add 1ml of each of the 100 times dilutions to each of the remaining 3 test tubes and mix to make 1,000 times dilutions (1ul).
6) Incubate all 12 test tubes for at least 5 days at 30-35°C.
7) Calculate the most probable number of microorganisms/ml.

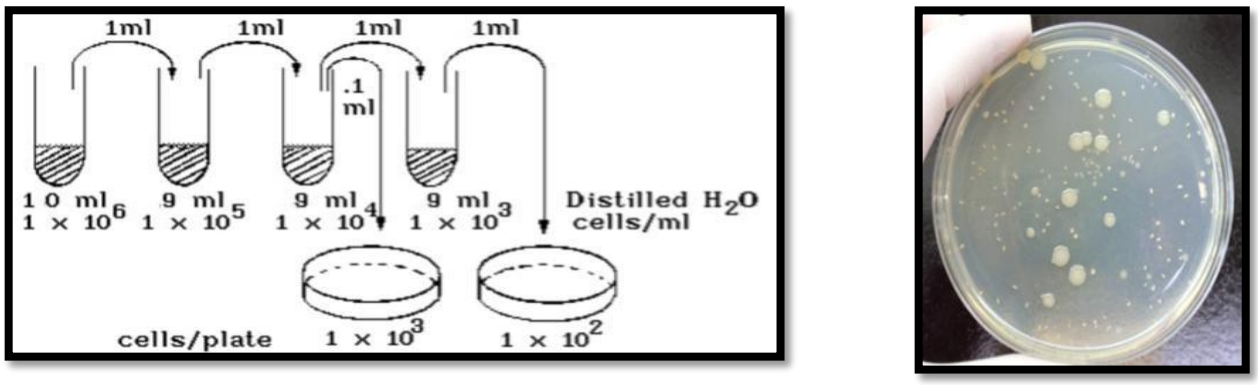

Fig.4.14.1 TAMC(total aerobic microbial count), TYAC(total yeast mould count)

Activities performed at Microbiology Laboratory

1. Media preparation

2. Autoclave validation

Aim: To validate autoclave for its efficacy of function

Protocol:

1) Geobacillus strip was stuck to any media bottles which are to be sterilized.
2) Autoclave was switched ON. After its complete cycle and pressure release, the strip attached was taken and placed in 50 ml Nutrient broth and incubated for 14 days.
3) Turbidity was checked regularly.

Inference: If the strip turns black, it shows positive results. Autoclave is perfectly validated

3. Time killer assay

Aim: To determine time killer assay for given sample

Sample: Scrub with antibacterial activity for microbes such as, *E.coli, S.aureus* and *K.pneu -moniae*

Protocol :

1) For 0th hour, 50ml of saline was prepared and sterilized.
2) Sterilized saline media bottle was passed in the passbox. After 10 mins, Bottle was taken from the pass box, sanitized with 70%IPA and placed in a presterilized Laminar hood.
3) Test organisms were adjusted in a 50 ml of saline to 0.07 OD using a spectrophotometer using a loop.
4) To the same bottle, scrub was cut into 3 pieces of 1cm (L*B) was placed. Each ml of saline with culture from the above bottle was added to a centrifuge tube containing 9 ml of sterilized lecithin media.
5) Saline bottle with culture was kept in an incubator shaker for 4 hours. From sample added lecithin tube, 1 ml is serially diluted to 6 tubes containing 9 ml of sterilized saline and Vor texed for uniformity of microbes. 1 ml from each 7 tubes were poured into 7 petri plate res pectively. SCDA media was poured into samples containing plates.
6) Plates were kept in an incubator. The same protocol was followed for 0th hour and for the remaining 2 cultures for 5 samples.
7) Again same procedure for 4th hour for 3 microbial cultures for all samples and results were obtained to determine antimicrobial activity of given scrub.

Inference: If colony counts are decreased in number from 0th to 4th hour, then one can say it rapidly challenged species are killed by sample and have claimed activity.

4. **Preservative Efficacy Test**

Aim: To determine activity of preservative in given sample

Sample: Face serum with green tea and coffee

Protocol:

1) To 50 ml sterilized tubes given sample of about 20 ml was added.
2) To the same 10^7 CFU/ml of cultures namely, *E.coli, S.aureus, A.niger, C.albicans* were added. Incubated for 30 mins at room temperature.
3) 1 ml from above incubated tube was serially diluted in 7 tubes (1st lecithin and 2nd to 6th Saline was added). Each ml was plated on to SCDA for bacteria and SCDM for fungi Organisms media containing petri plates.
4) Then 50 ml tubes of cultures & samples were kept for 7 days undisturbed at 37℃.
5) The same protocol was followed for 7th, 14th, 28th days respectively.
6) Colonies were counted and results were analyzed to determine efficiency of activity of preservative in face serums.

Inference: If colony counts decrease from 0th day to 28th day, then one can say that preservatives are present and are effective in protecting samples from microbial growth.

5. Intermediate checks for instruments in Microbiology laboratory

Aim: To determine instruments are showing correct values.

Parameters focused: Standard input, reading, error observed in ℃/µl/mins, limit (temperature and time)

Instruments checked are listed in table no.

Sl.no	**Instrument**	**Range**
1.	Refrigerator	2 to 8℃
2.	Fungal incubator	22 to 25℃
3.	Autoclave (for decontamination)	121℃, 15mins
4.	Hot air oven	50 to 125℃
5.	Variable micropipette	100-1000µl
6.	Autoclave (for sterilization)	121℃, 15mins
7.	Micropipette	1000µl
8.	Bacteriological incubator	35 to 37℃

CHAPTER 5

REFLECTION OUTCOMES

I take this opportunity to express my deep sense of gratitude to Radiant Research Services Pvt Ltd for giving me this opportunity to carry out my internship in the company. I especially thank Mr. Dinesh K.G and Dr. Chandrasagar in the organisation who helped me throughout my internship in all possible ways. I would extremely thankful to the DTL, Microbiology, Molecular Biology, Pre-clinical department, for providing me with all necessary knowledge without which the completion of my internship wouldn't have been possible.

During the internship I learned about organization management. I learned to co-operate and function in multidisciplinary teams. Developed self-confidence and an ability to communicate effectively to understand research literature, identify thrust areas and evolve methods of analysis for solving multidisciplinary challenges. I developed my verbal ability, personality and also learned how to manage time. During my internship period in the organisation I acquired lots of information about different instruments used in the DTL, Microbiology, Molecular Biology department of the company.

I gained an ability to conduct real time experiments and process to meet the desired needs within realistic constraints such as economic, environmental, social, health and safety. I acquired an understanding about the different processes carried out in the DTL, Microbiology, Molecular Biology department such as determination of total ash, moisture content, Sandwich ELISA, TAMC, TYMC, etc. A recognition of the need for and an ability to engage in life-long learning in new trends from time to time. I acquired the capability and enthusiasm for self- improvement through life-long learning.

CHAPTER 6

CONCLUSION

The one and half month internship at Radiant Research Services private limited was an excellent and worthwhile experience for me as I got to learn a lot of things in the organisation. The time spent in the organisation helps me to find out my strength and weakness which will help me to improve my skills. The internship program provided me with a great value of information to broad and expand my educational sphere. In this short time, I observed how the department works and also the different processes carried out in the department.

At Radiant Research Services Pvt ltd, I acquired my training in Drug Testing Lab, Microbiology Lab, Molecular Biology Lab, Animal House, where I learned about different processes such as determination total ash, moisture, TAMC, TYMC, etc. I have confidently completed the given tasks and objectives within time and our purpose of doing the internship was being fulfilled.

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BVVS

DEPARTMENT OF BIOTECHNOLOGY

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOTE-587102 KARNATAKA

[TEQIP lead Institute, Govt. Aided AICTE Recognized Affiliated to VTU Belgavi]

CERTIFICATE

This is to certify that the **"Internship Report"** submitted by Ms. Shilpa S Kugunavar, bearing USN: 2BA20FBT05, in partial fulfillment of M.Tech Food Biotechnology, at Department of Biotechnology, Basaveshwar Engineering College (A), Bagalkote, affiliated to Visveshvarayya Technological University, Belgavi during the academic year 2021-2022. It is certified that all corrections, suggestions indicated during Internal Assessment have been incorporated in the report.

Dr. G B Megeri
Coordinator

Dr. Bharathi S Meti
H O D

Examiners

Signature with date

1) Dr G.B. Megeri _____ 14/3

2) Dr. Bharati S. Meti _____ 14/3/22

3) _____ _____

Spirulina Based Food Products

1.Introduction

Spirulina is a biomass of cyanobacteria (blue-green algae) that can be consumed by humans and animals. The three species are Arthrospira *platensis*, A. *fusiformis*, and A. *maxima*.Cultivated worldwide, Arthrospira is used as a dietary supplement or whole food.It is also used as a feed supplement in the aquaculture, aquarium, and poultry industries

Spirulina thrives at a pH around 8.5 and above and a temperature around 30 °C (86 °F). They are autotrophic, meaning that they are able to make their own food, and do not need a living energy or organic carbon source. A nutrient feed for growing it is:

Baking soda 16 g/l (61 g/US gal)

Potassium nitrate 2 g/l (7.6 g/US gal)

Sea salt- 1 g/l (3.8 g/US gal)

Potassium phosphate 0.1 g/l (0.38 g/US gal)

Iron sulphate 0.0378 g/l (0.143 g/US gal)

As an ecologically sound, nutrient-rich dietary supplement, spirulina is being investigated to address food security and malnutrition, and as dietary support in long-term space flight or Mars missions. Its advantage for food security is that it needs less land and water than livestock to produce protein and energy.

Dried spirulina contains 5% water, 24% carbohydrates, 8% fat, and about 60% (51–71%) protein .Provided in its typical supplement form as a dried powder, a 100-g amount of spirulina supplies 290 kilocalories (1,200 kJ) and is a rich source (20% or more of the Daily Value, DV) of

numerous essential nutrients, particularly protein, B vitamins (thiamin, riboflavin, and niacin, providing 207%, 306%, and 85% DV, respectively), and dietary minerals, such as iron (219% DV) and manganese (90% DV) (table). The lipid content of spirulina is 8% by weight (table) providing the fatty acids, gamma-linolenic acid, linoleic acid, stearidonic acid, eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and arachidonic acid. In contrast to those 2003 estimates (of DHA and EPA each at 2 to 3% of total fatty acids), 2015 research indicated that spirulina products "contained no detectable omega-3 fatty acids" (less than 0.1%, including DHA and EPA). An in vitro study reported that different strains of microalgae produced DHA and EPA in substantial amounts.

2.HISTORICALBACKGROUND ON THE USE OF SPIRULINA AS HUMAN FOOD AND ANIMAL FEED

Spirulina is a primitive organism originating some 3.5 billion years ago that has established the ability to utilize carbon dioxide dissolved in seawater as a nutrient source for their reproduction. Spirulina is a photosynthesizing cyanophyte (blue-green algae) that grows vigorously in strong sunshine under high temperatures and highly alkaline conditions.

2.1 Historical use

In the sixteenth century, when the Spanish invaders conquered Mexico, they discovered that the Aztecs living in the Valley of Mexico in the capital Tenochtitlan were collecting a “new food” from the lake.Spanish chroniclers described fishermen with fine nets collecting this blue coloured “techuitlatl” from the lagoons and making a blue-green cake from it. Other legends say Aztec messenger runners took spirulina on their marathons. Techuitlatl was mentioned by naturalists until the end of the sixteenth century, but not after that, probably reflecting the loss of the lakes as they were drained for urban and agricultural development. The only remnant today, Lake Texcoco, still has a living algae spirulina population. The Kanembu population living along the shores of Lake Chad collects the wet algae in clay pots, drain out the water through bags of cloth and spread out the algae in the sandy shore of the lake for sun drying.

The semi-dried algae is then cut into small squares and taken to the villages, where the drying is completed on mats in the sun. When dry, women take these algae cakes for sale in the local

market. Dihé is crumbled and mixed with a sauce of tomatoes and peppers, and poured over millet, beans, fish or meat and is eaten by the Kanembu in 70 percent of their
meals. Pregnant women eat dihé cakes directly because they believe its dark colour will screen their unborn baby from the eyes of sorcerers . Spirulina is also applied externally as a poultice for treating certain diseases.It is also noted that the local trading value of the dihé annually harvested from Lake Kossorom in Chad (about 40 tonnes) amounts to more than US $100,000, which represents an important contribution to the economy of the area.

2.2 Rediscovery of spirulina

In 1940, a French phycologist Dangeard published a report on the consumption of dihé by the Kanembu people near Lake Chad . Dangeard also noted these same algae populated a number of lakes in the Rift Valley of East Africa, and was the main food for the flamingos living around those lakes. Twenty-five years later during 1964-65, a botanist on a Belgian Trans-Saharan expedition, Jean Léonard, reported finding a curious greenish, edible cakes being sold in native markets of Fort-Lamy (now N'Djamena) in Chad . When locals said these cakes came from areas near Lake Chad, Léonard recognized the connection between the algal blooms and dried cakes sold in the market. In 1967 spirulina was established as a "wonderful future food source" in the International Association of Applied Microbiology . Analysis of the nutritional properties of spirulina showed first and foremost an exceptionally high protein content, of the order of 60–70 percent of its dry weight; it also showed the excellent quality of its proteins (balanced essential amino acid content). This first data was enough to launch many research projects for industrial purposes in the 1970s, because micro-organisms (yeast, chlorella, spirulina, some bacteria and moulds) seemed at that time to be the most direct route to inexpensive proteins – the iconic "single cell proteins". At the same time when Léonard rediscovered spirulina in Africa, a request was received from a company named Sosa-Texcoco Ltd by the "Institut français du pétrole" to study a bloom of algae occurring in the evaporation ponds of their sodium bicarbonate production facility in a lake near Mexico City. As a result, the first systematic and detailed study of the growth requirements and physiology of spirulina was performed. This study, which was a part of Ph.D. thesis by Zarrouk (1966), was the basis for establishing the first large-scale production plant of spirulina

3.Biochemical composition

The basic biochemical composition of spirulina can be summarized as follows:

Protein: Spirulina contains unusually high amounts of protein, between 55 and 70 percent by dry weight, depending upon the source . It is a complete protein, containing all essential amino acids, though with reduced amounts of methionine, cystine, and lysine, as compared to standard proteins such as that from meat, eggs, or milk; it is, however, superior to all standard plant protein, such as that from legumes.

Essential fatty acids: Spirulina has a high amount of polyunsaturated fatty acids (PUFAs), 1.5–2.0 percent of 5–6 percent total lipid. In particular spirulina is rich in γ-linolenic acid (36 percent of total PUFAs), and also provides γ-linolenic acid (ALA), linoleic acid (LA, 36 percent of total), stearidonic acid (SDA), eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA) and arachidonic acid (AA).

Vitamins: Spirulina contains vitamin B1 (thiamine), B2 (riboflavin), B3 (nicotinamide), B6 (pyridoxine), B9(folic acid), B12 (cyanocobalamin), vitamin C, vitamin D and vitamin E.

Minerals: Spirulina is a rich source of potassium, and also contains calcium, chromium, copper, iron, magnesium, manganese, phosphorus, selenium, sodium and zinc.

Photosynthetic pigments: Spirulina contains many pigments including chlorophyll a, xanthophyll, beta-carotene, echinenone, myxoxanthophyll, zeaxanthin, canthaxanthin, diatoxanthin, 3-hydroxyechinenone, beta-cryptoxanthin, oscillaxanthin, plus the phycobiliproteins c-phycocyanin and allophycocyanin.

Detailed biochemical composition analyses have been conducted of spirulina grown either under laboratory conditions, collected in natural condition or in mass culture system using different agro-industrial waste effluent. This was found to vary in response to the salinity of the growing medium.It is reported that salt-adapted cells had a modified biochemical composition with a reduced protein and chlorophyll content, and increased carbohydrate content. However the following provides a review of the literature on the broad composition of spirulina.

3.1 Proximate composition

Spirulina has high quality protein content (59–65 percent), which is more than other commonly used plant sources such as dry soybeans (35 percent), peanuts (25 percent) or grains (8–10 percent). A special value of spirulina is that it is readily digested due to the absence of cellulose in its cell walls (as it is the case for eukaryotic green microalgae such as Chlorella, Ankistrodesmus, Selenastrum, Scenedesmus): after 18 hours more than 85 percent of its protein is digested and assimilated (Sasson, 1997). The composition of commercial spirulina powder is 60 percent protein, 20 percent carbohydrate, 5 percent fats, 7 percent minerals, and 3–6 percent moisture, making it a low-fat, low calorie, cholesterol-free source of protein.

4.CULTIVATION AND PRODUCTION OF SPIRULINA

4.1 Natural production

Most commercial production systems are based on shallow raceways in which spirulina cultures are mixed by a paddle wheel. However, there are still some examples of spirulina being harvested commercially from naturally occurring populations. In Mexico, following the research conducted in 1967 in collaboration with the French Oil Institute, Sosa-Texcoco Ltd has been harvesting Spirulina maxima from an area of Lake Texcoco, at 2 200 m above sea level, in a semi-tropical environment, in the Valley of Mexico, with an average annual temperature of 18 ºC. The same company used to extract soda from the lake deposits since 1936. This is the largest single plant for the production of spirulina biomass. The so-called “semi-natural” cultivation process consists of harvesting during day and night and the algal biomass doubles in three to four days. After filtration, the algal biomass is spray-dried after homogenization and pasteurization. The first pilot plant which produced 150 tonnes of dry spirulina biomass per year started production in 1973; its production capacity was thereafter raised to 300 tonnes of medium-grade product per year from 12.0 hectares of natural ponds. Sosa-Texcoco Ltd had invested some US$5 millions since 1977 to solve the engineering problems arising from the increase in production and to run the toxicological tests indispensable before marketing the product .

The annual value of spirulina production represented a third of the company's income from the manufacture of powdered soda from the lake deposits. In 1995, Sosa-Texcoco ceased production of spirulina. Another semi-natural lake in Myanmar has been reported to be used as a production site for spirulina. Four volcanic lakes with natural spirulina blooms were studied beginning in

1984. Production began at Twin Taung Lake in 1988, and by 1999 increased to 100 tonnes/year. About 60 percent is harvested from boats on the surface of the lake, and about 40 percent is grown in outdoor ponds alongside the lake.

During the blooming season in the summer, when spirulina forms thick mats on the lake, people in boats collect a dense concentration of spirulina in buckets. Spirulina is harvested on parallel inclined filters, washed with fresh water, dewatered and pressed again. This paste is extruded into noodle-like filaments which are dried in the sun on transparent plastic sheets. Dried chips are taken to a pharmaceutical factory , pasteurized, and pressed into tablets.

4.2 Laboratory cultivation

Eight major environmental factors influence the productivity of spirulina: luminosity (photo-period 12/12, 4 luxes), temperature (30 °C), inoculation size, stirring speed, dissolved solids (10–60 g/litre), pH (8.5–10.5), water quality, and macro and micronutrient presence (C, N, P, K, S, Mg, Na, Cl, Ca and Fe, Zn, Cu, Ni, Co, Se) .

4.2.1 Light regimes

The characteristics of light attenuation and light utilization on the growth of Spirulina platensis cells in culture conditions. They found two concepts useful for spirulina culture, viz. average irradiance and specific light energy utilization rate introduced to describe the relationship between cell growth and light utilization. They also recorded four basic parameters such as

maximum specific growth rate (1.75 μm/day), half light-saturation constant (1.453 x 103 1x), light coefficient {(3.637/103) (OD560/cm2)/mW}. Zeng, Cai and Ouyang (2001b) also found that introduction of 1 percent CO2 in culture system helps to increase final cell concentration and stabilize the pH of the culture of spirulina. Pareek and Srivastava (2001) conducted an experiment to determine the optimum photoperiod for the growth and yield of the Jaipur (India) isolate of Spirulina platensis in different photoperiods. They found that the optimum photoperiod is 16 hours/day based on the evaluation of optical density and chlorophyll content of S. platensis. Paoletti, Pushoaraj and Tomaselli (1975) studied the growth performances of Spirulina platensis and S. maxima under photo-limited conditions using Roux bottles of 1.0 litre capacity incubated in a water bath at 30 °C. It was irradiated intermittently from one side with battery of fluorescent lamps (PAR intensity equal to 65.30 J/m2/second) in light:dark cycle (12 hours:12 hours). The initial biomass concentration of spirulina was 350 mg (dry weight)/litre which attended to a maximum dry weight of 346 and 329 mg/litre in the cases of S. platensis and S. maxima, respectively. The culture solution was the standard bicarbonate-carbonate medium at pH 9–9.5 with bubbling air and 1 percent CO2.

Nutritional media :

The culture of spirulina is practised in different media, especially inorganic and decomposed organic nutrients. Different types of spirulina were cultured to evaluate growth and biochemistry under similar controlled conditions . They cultured three species of Spirulina viz. Spirulina platensis, S. laxissima and S. lonar. Of the three species S. platensis showed highest growth rate, biomass, pigment concentration and low intracellular phenolics. The results indicate that S. platensisreached highest growth in shortest doubling time and the importance of strain selection for large-scale cultivation.It is found that the intermittent addition of urea in the autotrophic culture of Spirulina platensis yielded similar results to those obtained by the continuous feeding. They further concluded that the operation mode of using urea intermittently would be preferable to reduce the production costs of this cyanobacterium in large-scale facilities.

5. Harvesting and processing :

Spirulina harvesting, processing and packing has eight principle stages:

1. Filtration and cleaning : A nylon filter at the entrance of the water pond is needed
2. Pre-concentration: To obtain algal biomass which is washed to reduce salts content
3. Concentration: To remove the highest possible amount of interstitial water
4. Neutralization: To neutralize the biomass with the addition of acid solution
5. Disintegration: To break down trichomes by a grinder
6. Dehydration by spray-drying: This operation has great economic importance since it involves about 20–30 percent of the production cost
7. Packing: It is usually in sealed plastic bags to avoid hygroscopic action on the dry spirulina, and
8. Storage: Stored in fresh, dry, unlit, pest-free and hygienic storerooms to prevent spirulina pigments from deteriorating

Spray Drying:

Spray drying is a method of producing a dry powder from a liquid or slurry by rapidly drying with a hot gas. This is the preferred method of drying of many thermally-sensitive materials such as foods and pharmaceuticals,or materials which may require extremely consistent, fine, particle size. Air is the heated drying medium; however, if the liquid is a flammable solvent such as ethanol or the product is oxygen-sensitive then nitrogen is used

All spray dryers use some type of atomizer or spray nozzle to disperse the liquid or slurry into a controlled drop size spray. The most common of these are rotary disk and single-fluid high pressure swirl nozzles. Atomizer wheels are known to provide broader particle size distribution, but both methods allow for consistent distribution of particle size. Alternatively, for some applications two-fluid or ultrasonic nozzles are used. Depending on the process requirements,

drop sizes from 10 to 500 μm can be achieved with the appropriate choices. The most common applications are in the 100 to 200 μm diameter range. The dry powder is often free-flowing.

A spray dryer takes a liquid stream and separates the solute or suspension as a solid and the solvent into a vapor. The solid is usually collected in a drum or cyclone. The liquid input stream is sprayed through a nozzle into a hot vapor stream and vaporized. Solids form as moisture quickly leaves the droplets. A nozzle is usually used to make the droplets as small as possible, maximizing heat transfer and the rate of water vaporization. Droplet sizes can range from 20 to 180 μm depending on the nozzle. There are two main types of nozzles: high pressure single fluid nozzle (50 to 300 bars) and two-fluid nozzles: one fluid is the liquid to dry and the second is compressed gas (generally air at 1 to 7 bars).

Spray dryers can dry a product very quickly compared to other methods of drying. They also turn a solution (or slurry) into a dried powder in a single step, which simplifies the process and improves profit margins

Kjejdahl method for protein analysis

The Kjeldahl method or Kjeldahl digestion in analytical chemistry is a method for the quantitative determination of nitrogen contained in organic substances plus the nitrogen contained in the inorganic compounds ammonia and ammonium (NH_3/NH_4^+). Without modification, other forms of inorganic nitrogen, for instance nitrate, are not included in this measurement. Using an empirical relation between Kjeldahl nitrogen content and protein content it is an important method for analyzing proteins. This method was developed by Johan Kjeldahl in 1883.

The method consists of heating a sample to 360–410 °C with concentrated sulfuric acid (H_2SO_4), which decomposes ("digests" or "destructs") the organic sample by oxidation to liberate the reduced nitrogen as ammonium sulfate. Hot concentrated sulfuric acid oxidizes carbon (as bituminous coal) and sulfur (see sulfuric acid's reactions with carbon)

$$C + 2\ H_2SO_4 \rightarrow CO_2 + 2\ SO_2 + 2\ H_2O$$

$$S + 2\ H_2SO_4 \rightarrow 3\ SO_2 + 2\ H_2O$$

Catalysts like selenium, Hg2SO4 or CuSO4 are often added to make the digestion go faster. Na2SO4 or K2SO4 is also added to increase the boiling point of H2SO4. Digestion is complete when the liquor clarifies with the release of fumes. A distillation system depicted below is built.

Kjeldahl digestion Kjeldahl distillation:

The end of the condenser is dipped into a known volume of standard acid (i.e. acid of known concentration). A weak acid like boric acid (H3BO3) in excess of ammonia is often used. Standardized HCl, H2SO4 or some other strong acid can be used instead, but this is less commonplace. The sample solution is then distilled with a small amount of sodium hydroxide (NaOH). NaOH can also be added with a dropping funnel. NaOH reacts the ammonium (NH4+) to ammonia (NH3), which boils off the sample solution. Ammonia bubbles through the standard acid solution and reacts back to ammonium salts with the weak or strong acid.

Ammonium ion concentration in the acid solution, and thus the amount of nitrogen in the sample, is measured via titration. If boric acid (or some other weak acid) was used, direct acid–base titration is done with a strong acid of known concentration. HCl or H2SO4 can be used. Indirect back titration is used instead if strong acids were used to make the standard acid solution: strong base of known concentration (like NaOH) is used to neutralize the solution. In this case, the amount of ammonia is calculated as the difference between the amount of HCl and NaOH. In the case of direct titration, it is not necessary to know the exact amount of weak acid (e.g. boric acid) because it does not interfere with the titration (it does have to be in excess of ammonia to efficiently trap it). Thus, one standard solution is needed (e.g. HCl) in the direct

titration, while two are needed (e.g. HCl and NaOH) in the back-titration. One of the suitable indicators for these titration reactions is Tashiro's indicator.[3]

In practice, this analysis is largely automated; specific catalysts accelerate the decomposition. Originally, the catalyst of choice was mercuric oxide. However, while it was very effective, health concerns resulted in it being replaced by cupric sulfate. Cupric sulfate was not as efficient as mercuric oxide, and yielded lower protein results. It was soon supplemented with titanium dioxide, which is currently the approved catalyst in all of the methods of analysis for protein in the Official Methods and Recommended Practices of AOAC International.

6.CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

Spirulina appears to have considerable potential for development, especially as a small-scale crop for nutritional enhancement, livelihood development and environmental mitigation. In particular, the

production and use of spirulina has the following advantages:

• It provides an easily digestible high (c. 60 percent) protein product with high levels of β-carotene, vitamin B12, iron and trace minerals and the rare essential fatty acid γ-linolenic acid (GLA). In addition, it has no obvious negative cultural or religious issues associated with its consumption;

•Its production occupies only a small environmental footprint, with considerable efficiencies in terms of water use, land occupation and energy consumption when compared to traditional terrestrial crops;

•Its production is especially suitable to saline and alkaline conditions that are often unfavourable to traditional crops and are frequently occupied by disadvantaged people suffering from, or vulnerable to, natural disasters;

•Its production can be conducted at a number of different scales, from household “pot culture” to intensive commercial development over large areas;

•It has the potential for integration with rural organic waste treatment processes to improve both environmental conditions and improve energy transfer efficiencies;

FAO fisheries statistics show a clear increase in production of spirulina over the recent years. For example, production in China was first recorded at 19 080 tonnes in 2003 and rose sharply to 41 570 tonnes in 2004, worth around US$7.6 millions and US$16.6 millions, respectively. However, there are no apparent figures for production in the rest of the world. This suggests that, despite the widespread publicity about spirulina and its benefits, it has not yet received the serious consideration it deserves as a potentially key crop in coastal and alkaline areas where traditional agriculture struggles, especially under the increasing influence of salination and water shortages.

An examination of the literature and research on spirulina also suggests that interest in its development has waned over recent years. Much of the work was conducted over the 1980s and 1990s with relatively little over the last decade. Most modern writing available on the internet appears to be “grey” literature, with relatively little internationally recognized scientific material. Given the increasingly widely recognized impacts of global climate change in terms of both desertification and the more prevalent extreme weather conditions that impact poor communities in particular, this loss of focus is regrettable.

6.2 Recommendations

There is a role for both national governments as well as inter-governmental organizations to reevaluate the potential of spirulina to fulfill both their own food security needs as well as a tool for their

overseas development and emergency response efforts. Other international organizations that have developed both an interest and capacity for developing small-scale spirulina production would be key potential facilitators in demonstrating available technologies for local uptake. They could also develop improved technical and economic solutions to spirulina production in environmentally impoverished conditions, as well as prepare tested production packages for rapid deployment in emergency situations.

International organization(s) working with spirulina should consider preparing a practical guide to small-scale spirulina production that could be used as a basis for extension and development methodologies.

This small-scale production should be orientated towards:

(i) providing nutritional supplements for widespread use in rural and urban communities where the staple diet is poor or inadequate;

(ii)Allowing diversification from traditional crops in cases where land or water resources are limited;

(iii)An integrated solution for waste water treatment, small-scale aquaculture production and other livestock feed supplication;

(iv)As a short- and medium-term solution to emergency situations where a sustainable supply of high protein/high vitamin foodstuffs is required. This implies the ability to rapidly install systems in a variety of environments that can be sustained by local communities to cover

both the short-term food needs and to supplement longer-term nutritional requirements, especially once other forms of food relief cease to be delivered.

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CERTIFICATE

This is to certify that the project entitled, "Development of wheat bran flakes incorporated with pomegranate and pumpkin seeds" is a work carried out by Miss. Goutami R Hadimani bearing USN: 2BA20FBT01, in partial fulfilment for the award of M.Tech Food Biotechnology, in the Department of Biotechnology, Basaveshwar Engineering College (A), Bagalkote, affiliated to Visvesvaraya Technological University, Belagavi during the academic year 2021-2022. To the best of our knowledge, the work reported in this dissertation has not been submitted by the candidate elsewhere for the award of any other degree. It is certified that all corrections, suggestions indicated during Internal assessment have been incorporated in the report.

Dr. Shilpa K J	Dr. Jayachandra S Y	Dr. Bharati S M	Dr. S S Injaganeri
Guide	Coordinator	HOD	Principal

Examiners **Signature with Date**

1. Dr. S. K. Jigajinni — 19/9/2022
2. Dr N. RAJESWARI — 19/9/2022
3. Dr. Bharati S. Mek — 19/9/22

CHAPTER 1

INTRODUCTION

Wheat bran

Wheat bran flakes is a product of breakfast cereal similar to corn and oats flakes presently owned by Post holdings. The cereal contains of small toasted flakes of wheat bran together with seasonings and the binders. They may be fortified to add nutritional value. They are usually served with the cold milk. Wheat is the second most circulated cereal for human food after the crop rice. It is one of the furthermost main food crops consumed by more than one third of population of the world due to the presence of maximum number of calories. Wheat is not only measured as nutritious grain but is also a rich source of other nutrients such as proteins, minerals, vitamin B and dietary fibres. Wheat is mainly cultivated in India, China, Russia, USA.

The grain part is the side-effect of processing process and has food and non-food applications. The utilization of wheat grain by people has progressively expanded over the course of the years universally. Wheat is a piece of the external pericarp layer of the wheat grain, which is left as a result after the processing system which has both food and non-food claims. As the human ingesting of wheat grain has expanded more than a year a large number of the detached results of wheat horse shelter are accessible on the lookout. Wheat grain is plentiful in dietary strands, vitamin B, minerals, unpredictable mixtures and numerous bioactive mixtures which are helpful to the human wellbeing. There is an appeal and attention to the shoppers towards the better food varieties and this has prompted the consolidation and investigation of the fixings from the regular hotspots for the food creation and wheat grains has extremely fine mixed for the detachment of the mixtures with more wellbeing profits(19).

Arrangement of wheat grain is appropriately founded on the various methodologies utilized for its detachment, conditions, assortment which controls how much starch appended to layer of aleurone after the partition interaction. The piece of the wheat contrast generally among various yields, significantly involves nutrients, minerals and dietary filaments. Microbe can likewise be added to grain contingent upon the processing strategy with raising the wheat with lipids. Grain comprises of numerous essential minerals like zinc, iron, manganese, magnesium and phosphorus(20).80% of Phosphorous in wheat is put away as phytates, shaping buildings with Mg, Fe and Mg, which Will impressively diminish their

bioavailability(35). 34 to 63 % of the wheat Bran is locked in by the unexpected supply of solvent and insoluble dietary fiber, a composite compound made of palatable plant polysaccharides (hemicellulose and celluloses) required to lignin's, proteins and different parts which escape the hydrolytic enzymatic absorption process in the upper digestive system of the body. Soluble dietary fibre comprises of 5 % of the total dietary fibre, consisting of glycan and xylenes. Dietary fibre enhances the health of the gut, regulates appetite and long satiation. Enhanced satiety Can be credited to gigantic water retention of dietary fiber, diminished stomach travel time, enhanced digest a thickness in the small digestive tract, and expanded stool mass and short-chain unsaturated fat creation, in the colon, because of maturation of the fiber. Dietary fiber assists in the aversion of colon ailments, thwarting gastric harmful development, treating disagreeable guts with disordering, diminishing the bet of haemorrhoids and hiatal hernia, hypocholesteraemia, reducing the bet of chest sickness and type 2 diabetes and hyper strain. Notwithstanding the way that there have been some work concluding the character of Wheat grain dietary fiber in human weight rule process (21).

Table1.1: Nutritional composition of wheat bran per 100g (35)

Sl .No	Bioactive compounds in wheat bran	Quality /100 g of wheat bran
1	Niacin	14 to 18 mg
2	Vitamin E	1.4 mg
3	Zinc	7.3 mg
4	Riboflavin	0.39 to 0.75 g
5	Thiamine	0.54 mg
6	Biotin	0.048 g
7	Ferulic acid	500 to 1500 mg
8	Iron	11 mg
9	Pyridoxin	1 to 1.3 mg
10	Manganese	12 mg

Pomegranate seed: pomegranates are a centre of nutrition. People globally use them in both the savoury, sweet dishes and juice, snacks and smoothies. Dried pomegranate seeds are the prevalent ingredient in grenadine syrup, sauces, granola bars, salad dressings and trail mixes. This delightful, juicy fruit can keep your bones healthy and reduce inflammation and

boost your performance in the gym. Pomegranate seeds are loaded with the minerals, phytochemicals and vitamins. *Ellagic acid*, one of the most plentiful antioxidants in this fruit, may improve metabolic health and avoid obesity**.** This natural compound reduces the expansion of white adipose tissue and fights inflammation making weight loss process calmer. This seed is ironic in polyphenols, a class of antioxidants that helps against the DNA damage and the reduce oxidative stress.

Table 1.2 :Nutritional composition of pomegranate seeds per 100g(53)

Sl. No	Nutrients in Pomegranate seeds	Per 100g of quantity
1	Potassium	236 mg
2	Sodium	3mg
3	Calcium	10 mg
4	Magnesium	12 mg
5	Phosphorous	36 mg
6	Zinc	0.35 mg
7	Dietary fibres	4 g
8	Cholesterol	0 mg
9	Protein	1.67 g

Health benefits of the pomegranate seeds

- Aids in weight loss
- Keeps heart healthy
- Rich in antioxidants that helps the body to protect from the free radicals
- Help in reducing kidney stones
- Supports Urinary and digestive health

Pumpkin seed

Pumpkin seeds are an excellent wellspring of solid oils, magnesium, and different supplements that work on the wellbeing of the bones, heart and different purposes. Pumpkin seeds overall are viewed as exceptional and confided in significant Source of calcium, magnesium and potassium .Plant seeds are likewise a decent wellspring of polyunsaturated unsaturated fats (PUFAs) and cell reinforcements. The unsaturated fats in pumpkin seeds contain a scope of confided in Source of valuable supplements, like sterols, squalene, and tocopherols. Pumpkin seeds have been found to contain sterols and plant sterols and

phytosterols are known to assist with lessening levels of the terrible Low thickness lipoprotein cholesterol.

Table 1.3 : Nutritional composition of Pumpkin seeds per 100g

Sl. No	Nutrients in Pumpkin seeds	Per 100 g
1	Energy	559 Kcal
2	Carbohydrates	10.71 g
3	Protein	30.23 g
4	Fibre	6 g
5	Niacin	4.98 g
6	Vitamin E	35.10 mg
7	Iron	8.82 g
8	Potassium	809 mg
9	Calcium	46 mg
10	Zinc	7.81 mg
11	Folate	58 µg

Health benefits of pumpkin seeds

- Improves heart health
- Improves kidney health
- Reduces risk of the diabetes
- Controls cholesterol levels
- Fights ageing
- Rejuvenates and improves skin health

Objectives of the project

- To develop wheat bran flakes incorporated with pomegranate seeds and pumpkin seeds
- To Evaluate sensory characteristics of product
- To conduct proximate analysis of product

- To carry out shelf-life study of the product

CHAPTER 2

REVIEW OF LITREARUE

2.1 Cereal flakes as breakfast

These cereal flakes are formed from parts of bits or entire grain like maize, wheat, grain, rice, and oats. They are created so as to get pre-produce items and chipping corn meal that structure into a drop. The whole grains go through various cycles, for example, pre-processing, blending, cooking, cooling, drying, chipping, toasting, and bundling for the development of cereal flakes. The demand of the worldwide cereal flakes market is supposed to extend at a the CAGR(compound annual growth rate)of 6% to 7% during the gauge time frame 2022-2032. Rising accentuation on the presentation of novel worth added oat drops with creative flavours is assessed to incline toward the development in the worldwide market. Cereal flakesbreakfast are a favoured type of breakfast, ate as customary food by huge range of populace universally. With the growing discretionary cash flow, customers are turning out to be more cognizant towards wellbeing and the day-to-day food ate. Oat drops are consumed either plain or might be covered with honey, natural product flavour, sugar, chocolate, an7d other such fixings. Moreover, oat chips are likewise accessible in a few shapes and sizes. The cereal drops market has seen a huge development inferable from variables, for example, purchaser twisting towards good food items. Besides, the expansion popular of comfort food items gives a colossal market an open door to the vital participants working in the grain chips market.

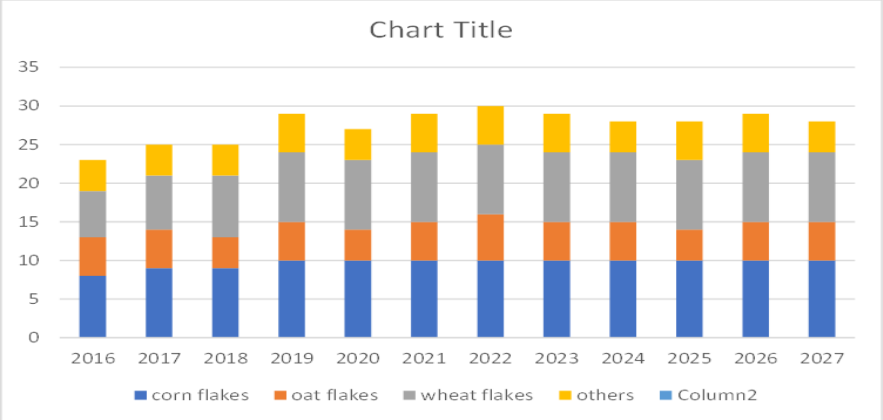


Fig 2.1 The cereal flakes market statistics according to USD

2.2 Different types of flakes

Flaked cereals are produced from the whole grain part or the parts of kernels of wheat, rice or corn and are produced with the addition of other Ingredient's such as the artificial or natural flavours, additives and other preservatives. There are many different types of Cereal flakes in the market and their composition is listed in the above Table No.3 . corn flakes is the one of the cereal flakes which is consumed world-wide and According to the USD around 6.3 million people consumed the corn flakes around daily basis and globally around 153 countries consume the corn flakes Kellogg's is the one of the leading corn flakes manufacturers in the current market (1). Then there are other food companies involved in making of different cereal flakes such as health sutra, Margins, Quaker these respective brands are involved in the manufacturing of the cereal flakes such as sorghum, Ragi, oats and rice flakes respectively (2). Ragi flakes are also more consumed by the consumers direct to its health benefits and naturally occurring nutrients and Health sutra is one of the brands involved in production of Ragi flakes . Ragi flakes are nutritious to human health and help on many health complications(3). Even the sorghum flakes are been included in the cereal flakes products where this sorghum flakes is mainly rich source of magnesium, a mineral which is more important to the bone health and other 600 biochemical reactions in human body(4).

Table 2.1: Different types and composition of Flakes

Sl .No	Different types of flakes	Company producing flakes	Composition of the flakes	References
1.	Corn flakes	Kellogg's	Corn, sugar, Malt extract, flavours, Vitamins and minerals	1
2.	Oats flakes	Quaker	Oats, sugar, artificial flavour, gaur gam, caramel colour, folic acid.	2
3.	Ragi flakes	Health sutra	Ragi flour, almond, honey, additives, preservatives.	3
4.	Sorghum flakes	Health sutra	Sorghum, rice flour, sugar, ammonium bi carbonate, preservatives etc.	4
5.	Bajara flakes	Murgins	Bajara, natural flavours, sugar, sodium bi carbonate ,additive and preservatives	5

2.3 Nutritional value-added flakes

For increasing the nutritional value of the flakes different flour combination of flour, seeds, herbs were incorporated with the flakes which indirectly enhances the Nutritional benefits to human health. Papaya flakes were formulated with combination of flour like corn, Maida and rice flour. The papaya flakes were sensory evaluated and packed in pouches and kept for 6 months for study and other quality characteristics were checked (5). Flax seeds were incorporated with the rice ,corn and wheat flour and in India flax seeds are considered as staple food crops and is used diversely due to its good nutritional benefits that is high in alpha linolenic acid (6). Dehydrated herbs are also been added in the flakes making the herbs such as basil, drumstick and mint these impart the high Nutritional factors as well as benefits

such as rich in vitamins and minerals. This addition of dehydrated herbs to the flakes was acceptable by the subjects during sensory evaluation (7). Then the water melon seeds and dried pluses were also were added to flakes as a value addition to the food product. Investigation into the properties of the pulses and knowing the nutritional benefits may lead to cost reduction and help in production of ready- to- eat foods.

Table 2.2 : Nutritional value-added flakes and their nutritional benefits

Sl. No	Flakes	Nutritional value-added Ingredients	Combination flour used in flakes	Nutritional factors	Health benefits	References
1.	Papaya flakes	Papaya fruit	Corn, rice, Maida flour	Rich in vitamin A, vitamin C, magnesium and phosphorus	Lowers cholesterol, improves thyroid gland and immunity functions.	6
2.	Flax seeds flakes	Flax seeds	Rice, corn, wheat flour	High in alpha linoleic acid, omega 3 fatty acids and aspartic acid	Helps in lowering blood cholesterol and helps to protect	7

					from obesity.	
3.	Black bean pulse flakes	Black bean	Maida, rice, wheat flour.	Rich in Vitamin B, minerals and fibres	Protect against the high cholesterol, type 2 diabetes and obesity	8
4.	Dehydrated Herb rice flakes	Basil and mint herbs	Rice and wheat flour	Rich in Macronutrients such as calcium and Vitamin K	Helps in curing worm Infection, stomach spams	9
5.	Water melon ragi flakes	Water melon seeds	Ragi, corn and wheat	Have good amount of zinc, copper, magnesium and phosphorus	Helps in digestion, improves immunity, promote healthy metabolism of the body	10

Table 2.3 : Flakes manufacturing brands and price of the flakes

SL.NO	Flakes	Brand	Quantity	Price(Rs)	References
1.	Corn flakes	Kellogg's	250g	95	
2.	Corn flakes	Nestle	1 kg	198	
3.	Corn flakes	Patanjali	100g	124	

4.	Oats flakes	Giva agro	1 kg	150	According to Edible flakes market forecast
5.	Wheat flakes	Natural land	250g	79	
6.	Wheat flakes	Baggrys	500g	230	
7.	All bran flakes	Kellogg's	425g	220	
9.	Ragi flakes	Health sutra	500g	230	
10.	Oat bran flakes	Arrow head	1 kg	170	

2.4 Types of seeds used in flakes

Seeds are the result of matured ovule, after the undeveloped organism sac is prepared by sperm from dust, shaping a zygote. The undeveloped organism inside a seed creates from the zygote, and develops inside the mother plant to a specific size before development is ended. The seed coat emerges from the integuments of the ovule Adding seeds or nuts to baking is an incredible method for upgrading the flavour as well as the presence of your heated merchandise. Besides the fact that they add surface, flavour and dynamic tones yet they likewise pack in heaps of nutrients and minerals(8). In above mentioned tabled no.6 mainly t authors have summarised the use of seeds in different food product that is the flax seeds are Developing mindfulness about the job of diet and journey for human wellbeing has fuelled interest in 'Practical food sources and utilitarian credits of numerous conventional food varieties are being revaluated. Flax keeps on flooding forward in its acknowledgment as a practical food and has as of late acquired consideration in the space of cardiovascular sickness principally on the grounds that it is the most extravagant known wellspring of alpha-linolenic corrosive, the phytoestrogen, lignin's, as well similar to a decent wellspring of dissolvable ,and these flax seeds find application in products like flakes, breads and the energy bars(9). And also, chia seeds are mainly good source of nutrients which have been used in the making of puddings, smoothies and salad dressings(10). The addition of these Seeds are incredible sources of the fibre. They likewise contain monounsaturated fats, polyunsaturated fats and numerous significant nutrients, minerals and cancer prevention agents. When consumed as a component of a sound eating regimen, seeds can assist with diminishing glucose, cholesterol and pulse.

Table 2.4 : Different types of seeds used in food product

SL.NO	Seeds used	Food product	Nutritional benefits	References

1.	Flax	flakes, breads, cereals, energy bars, oil	Lower cholesterol, reduce blood pressure	11
2.	Poppy	Muffins, rusk, bagel and sponge cakes	Rich in Manganese and helps in body to utilize Carbohydrates and fats	12
3.	sunflower	Salad oil, cookies, pesto sauce.	Rich in calories and loaded with Thiamine, riboflavin , Niacin helps in lowering rate of cardiovascular diseases	13
4.	Chia	Pudding, smoothies, salad dressing and energy bars	Rich in copper, Niacin, Manganese and helps in scalp health and body nourishment	14
5.	Nigella	Vegetable salad, crackers and Curries	Prevents stomach ulcers, packed with antioxidants and helps in blood sugar regulation in body	15
6.	Caraway	Breads, pastries, curries and stew	Prevent digestive problems such as heart burn, bloating stomach	16

2.5 Wheat bran recipes

Wheat bran are broadly utilized aswellspring of dietary fibre with improved medical advantages. Notwithstanding, its high application level in bread kitchen items caused lower nature of these items (e.g. Diminished size and expanded hardness of item). Diverse mechanical, physical or compound techniques are utilized for alteration of wheat grain physicochemical properties. Wheat grain got from the two wheat assortment was utilized to assess the impact of grain adjustment process on subjective properties of prepared merchandise. Adjustment was performed utilizing hot air and microwave warming. Different wheat bran recipes have been prepared as per above mentioned (Table 7) where different recipes with Ingredients ,baking temperature and time is also mentioned. (11).Wheat grain

has a sweet taste, yet not all think that it is engaging. It's additionally critical to begin slow while adding wheat grain to food sources. Excessively much can undoubtedly bring about the runs. Adding wheat grain to biscuits, flapjacks, rolls, waffles, or even treats is an incredible method for building up the healthy benefit of a food, particularly its fibre content. A limited quantity of wheat grain can be added to smoothies, particularly when it is finely powdered.

Table 2.5 : Different wheat bran food recipes existing in market

SL.NO	Recipes made out of wheat bran	Ingredients	Baking temperature and time	References
1.	Wheat bran Muffins	Wheat bran, butter milk, sugar, oil, egg, baking soda, baking powder and salt	176 ºC For 20 minutes	17
2.	Wheat bran cookies	Wheat bran, maida, oats, melted butter, baking soda, brown sugar and vanilla extract	135 ºC for 33 minutes	18
3.	Wheat bran bread	Wheat bran, milk, Maida, sugar, molasses, salt, dry yeast and water	190 ºC for 30 minutes	19
4.	Wheat bran yeast bread	Wheat bran, egg, salt, Maida flour, warm water, yeast and honey	190 ºC for 35 to 40 minutes	20
5.	Wheat bran pan cakes	Maida flour, salt, maple syrup, wheat bran, wheat flour, milk, butter and baking powder	Cooked at medium flame for 5 minutes	21

6.	Wheat bran waffles	Wheat flour ,wheat bran, salt, almond milk,baking powder, Maida, Vegetable oil.	140 ºC for 12 minutes	22

2.6 Proximate analysis parameters

The proximate analysis parameters plays a very vital role in retaining the quality characteristics of the food product as in the different cereal flakes the Ingredients used were different the proximate analysis parameters also differ in their values. The main parameters are the moisture, acid insoluble ash, fat, carbohydrates and proteins these parameters also impart their role in the Shelf-life study of the food product and the moisture in case of ragi flakes was high that is 11.6% and rice bran has the lowest moisture content in the referred papers that is 5.4%(12).The moisture content of the food product leads to vital role if the value is more than the standard value than that product undergoes the microbial contamination and damaging of the food product is observed. Ash is 0.1% maximum value according to FSSAI for the baked cereal products and this mainly represents the other components such as inorganic residue in the food product, Than it is observed that the Carbohydrates content is high in all cereal flakes when compared to the Protein content . The water absorption capacity of the cereal flakes was more so the fat used in the making of flakes is less in quantity for example in ragi flakes its 0.7 and rice flakes 0.2 and the value of the fat contributes to the rancidity that might cause due to free fatty acids in the food sample. proximate examination permits us to make authentic correlations of feeds based on unambiguous supplements. This makes it conceivable to realize how much preferred one feed is over one more regarding explicit supplements (13).

Table 2.6 : Proximate analysis parameters of different cereal flakes

SL.NO	Flakes	Moisture %	Acid insoluble ash %	Carbohydrate(g) Per 100g	Protein (g)per 100g	Fat(g)	References
1.	Corn	7.5	0.06	84	8	1	23

	flakes						
2.	Oats flakes	12	0.08	67.7	16.9	1.2	24
3.	Ragi flakes	11.6	0.07	80	30	0.7	25
4.	Bajara flakes	10.3	0.09	61.7	9.6	2	26
5.	Sorghum flakes	10.2	0.06	77	11	3	27
6.	Rice bran flakes	5.4	0.09	59	13	0.4	28

2.7 Sensory evaluation methods

Sensory assessment is a critical strategy to survey the flavour nature of food sources since it estimates what shoppers truly see; notwithstanding, it is an emotional technique. For instance, one purchaser might portray an example as unpalatable while another shopper might consider a similar example satisfactory. These distinctions are normal in tactile assessment and can be made sense of by identity, culture, individual variety, and so on. To get more objectiveness through tangible assessment, a sensible number of specialists should be prepared(14).Preparing conventions and boundaries should be painstakingly planned in light of the natural attributes of the tried food lattice and any conceivable variety among various examples brought about by food detailing, handling, bundling, capacity conditions, and so on. Consequently, tangible assessment can be extremely tedious and exorbitant. In the above referred papers form table No.9 the Hedonic Sensory method was adapted in more cases due to this method gave and scaling of 5,9 0r 10 which was used to illustrate the quality of food product in more mannered and acceptable way. The primary benefits of Hedonic rating tests are that the got results convey that estimated data linking with the agreeableness level of the thought about examples and the unalike item credits. Such tests likewise yield data with respect to the epicurean distance between the examples. Sensory Evaluation has been characterized as "A logical discipline used to bring out, measure, investigate and decipher responses to those properties of food varieties and materials as they are seen by feelings of

vision, smell, taste, contact, and hearing. Four factors influence assessment: the food, individuals and the testing climate and test techniques utilized(15).

Table 2.7 : Sensory evaluation methods adapted for cereal flakes.

Sl. No	Sensory method	Attributes	Number of panelists	Number of scales	References
1.	Hedonic method	Colour, flavour, texture and Overall Acceptability of product	15	9	29
2.	Paired Comparison method	Aroma, flavour, taste, crispness and colour	20	7	30
3.	Hedonic Method	Taste, flavour, colour, over all Acceptability of product	15	12	31
4.	Sensitivity and descriptive method	Taste, smell, flavour and texture	15	5	32
5.	Rating method	Aroma, mouth feel, texture and colour	20	9	33
6.	Hedonic method	Flavours, crispness, mouth feel, aroma and colour	15	7	34
7.	Hedonic scale method	Colour, texture, aroma, mouth feel, over all Acceptability of product	15	9	35

2.8 Shelf – life studies

shelf life is a realistic usability is the period of time that a product might be put away without becoming unsuitable for use, utilization, or sale at the end of the day, it could allude to whether a ware ought to at this point not be on a storeroom rack (ill-suited for use), or presently not on a grocery store rack (unsuitable available to be purchased, yet not yet ill suited for use). A study evaluates the food item quality and cleanliness by going through an exhaustive compound and physical, as well as microbiological examination and gives food makers and makers certainty of their item's timeframe of realistic usability. guard their image and buyers(16). The shelf-life study time period depends on the different food product and the Shelf-life attributes plays important part such as the moisture content of the food that is water activity results in degrading of food if the value is high. The Acidity of extracted fat is another attribute where the value of it denotes the extent of the rancidity of the food sample due to free fatty acids the rancidity results to bad odour. The shelf-life study were carried out for 3,6, 9 months after manufacturing of the product and the main factor was also that what kind of the packaging material was used during storage the material used were plastic container, glass container, paper boards and sealed plastic bags. Along with the packaging material the storage temperature matters more to the food sample since The guideline for putting away baking fixings that don't need refrigeration or freezing is to put them in a sealed shut holder in a space that is cool, dim, and dry. Ideal conditions are somewhere in the range of 50° and 70° F with a general mugginess level at or below 60%.Appropriate capacity of fixings and heated merchandise is fundamental for keeping food new and delectable and not gambling foodborne diseases(17).

Table 2.8 : Shelf-life study of cereal flakes for specific time period and attributes

SL.NO	Different type of flakes	Shelf-life time	Storage temperature	Attributes checked	Type of packaging used for	References

		period			**storage**	
1.	Corn flakes	3 months	25	Moisture, Acidity of extracted fat and taste	Paper boards box	36
2.	Corn flakes	6 months	15	Aroma, Moisture, Crispness and Acidity of extracted fat.	Plastic container	37
3.	Ragi flakes	6 months	26	Texture, Moisture, Acidity of extracted fat and taste	Cardboard box	38
4.	Bran flakes	3 months	35	Total acidity, Moisture and taste	Plastic films	39
5.	Corn flakes	6 months	25	Moisture content, Acidity of extracted fat and sensory attributes.	Air tight glass container.	40
6.	Oats flakes	3 months	18	Moisture content, Total acidity and	Air tight Plastic container	41

				taste		
7.	Ragi flakes	6 months	26	Taste, colour moisture content and Total acidity	Sealed plastic bags	42

CHAPTER 3

MATERIALS AND METHODS

3.1Procedure for making wheat bran flakes

Wheat bran flakes are rich in dietary fibres. and in making of wheat bran flakes The ingredients which were used were wheat bran, wheat flour, pomegranate seeds, pumpkin seeds, jaggery, baking powder, cardamom, cashew, vegetable oil and rice flour. The control sample was also considered where the pomegranate and the pumpkin seeds were not added to the mixture of the ingredients the quantity of the wheat flour and wheat bran was varied from the composition referred from the edible cereal market research and based on the different quantities of the wheat bran and wheat flour the three formulations that are WF1, WF2 and WF3 were formulated. The seeds cashews and almonds were roasted at low flame for 1 min so that moisture content to be reduced and roasting the dry fruits and seeds before adding to the other Ingredients is a great way for boosting their flavour. and roasting not only just enhance the existing flavours, but also unlock completely new flavour that weren't there before. After the roasting procedure the seeds and dry fruits (cashew and almond) were completely cooled so that the seeds and dry fruits become little crisp, and to avoid the sogginess. Then they are grinded into fine powder mixed with the other ingredients. The all Ingredients are mixed with water and kneaded properly to form a dough. The standing time of the dough was given 5 minutes as the wheat bran and wheat flour has high capacity of water absorption. Then after the completion of the dough standing time the dough was made into small balls so that they were feeded to the flake making machine, the small balls of dough were feeded to the flake machine top hopper and the dough balls were converted to the thin flakes. Then those flakes were subjected to the oven at temperature of 110 ℃ for 7 min. The flakes were taken out of the oven after 7 minutes and were cooled for 10 minutes before moving to packaging . Cooling time is more important for ensuring the significant loss of the moisture form the food product. After the completion of the cooling time of the, flakes. They will be directly directed towards the packaging. This allows them to protect them from the dirt, damage and moisture uptake by the product from the atmosphere the flakes were stored in the air tight container for retention of the quality of the wheat bran flakes.

3.2 Formulations used for preparation of wheat bran flakes per 100g

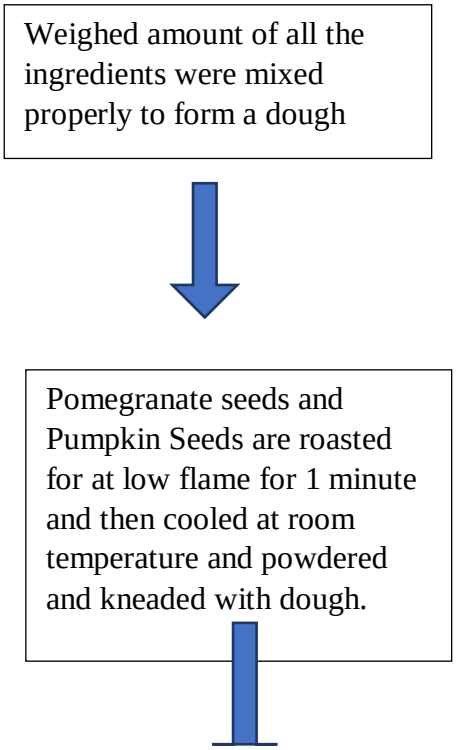
Table 3.1 : Different formulation of wheat bran flakes

SL. No	Treatment	wheat bran	wheat flour	pomegranate seeds	pumpkin seeds
1	Control	20g	40g	0	0
2	WF1	20 g	40 g	4 g	4 g
3	WF2	30 g	30 g	4 g	4 g
4	WF3	40 g	20 g	4 g	4 g

Note: WF: Wheat flakes

Flow chart of making wheat bran flakes

The weighed amount of all Ingredients that is Wheat bran, wheat flour, rice flour, pomegranate seeds, pumpkin seeds, jaggery, vegetable oil, cashew and almonds were mixed together for the formation of dough



Dough formation

Fig 3.1:WF1formulation

Fig 3.2:WF2 formulation

Fig 3.3:WF3 formulation

Formation of small balls before dough is put into the flake making machine

Fig 3.4: Making balls of the dough

Fig.3.5: Flake making machine

Formation of flakes of all the three formulations

Fig 3.6: WF1(before baking)

Fig 3.7:WF2(before baking)

Fig 3.8:WF3(before baking)

Baking of Wheat bran flakes was carried out at 120ºC for 7min in oven

Fig.3.9: Electric oven

After baking of the flakes, the trays were cooled at room temperature

Fig 3.10: WF1(after baking) Fig 3.11:WF2(after baking) Fig 3.12: WF3(after baking)

The flakes are completely cooled at room temperature and packed in air tight container

Fig 3.13: WF1

Fig 3.14: WF2

Fig 3.15: WF3

3.3 Sensory evaluation of the wheat bran flakes

Sensory analysis involves the scrutiny of a product by the senses taste, touch, odour and hearing of the various quality attributes which involve aroma, texture, sound and flavour. In this wheat bran flakes product project the Hedonic scale method was adapted for the sensory evaluation. This test elaborates the degree of consumer satisfaction and acceptance regarding product qualities. It shows the overall acceptance and relative importance of each attribute of the product.

During the Sensory evaluation of the wheat bran flakes product the place was made ensure that the room is free from the smell and place was quiet since a quiet and small free place helps in the focusing on the product in more well manner . All three formulated wheat bran flakes along with the Control was given(Control,WF1,WF2and WF3) for the sensory evaluation and 15 panellists were involved in the sensory evolution in which Staff and students were present and 5 scale hedonic sensory evaluation was carried out. Before carrying out the evaluation the instructions were conveyed to the panelists that not to discuss their opinions with other and the water full of bottles were placed Infront of panellists so that's they rinse their mouth with water after tasting each formulation The main of purpose of rinsing procedures is to maintain the baseline during the sensory evaluation to ensure that there is no any alterations of the perception based on the residual ambiances or sensations. The following attributes were considered in sensory evaluation of the wheat bran flakes

Aroma: is first partner of taste. These are the unstable mixtures which are assumed by the scent receptors of olfactory tissues of nasal pit. Sweet-smelling buildings are delivered during the biting system. Smell evaluates the fragrance of food that is basic in appreciation of flavour.

Taste: It includes the understanding of constituents subsequent to being broken down in the spit, water or oil by taste receptors in the taste buds tracked down quickly on the tongue and different pieces of mouth.

Mouth feel: Mouthfeel mentions to the physical sensations in mouth produced by food or drink, making it different from the taste. It is an important sensory attribute which along with smell and taste, governs the complete flavour of a food product.

Colour:The main nature of any food's appearance is its tone, especially when it is straightforwardly going with other nature of the food credits, for instance the adjustment of the misfortune in variety quality as food ruins or becomes unsatisfactory for purchasers.

Texture: Texture denotes to those qualities of a food that can be felt with tongue, fingers and teeth.

Based on the sensory evaluation of the product the majority of the panelists voted for the WF2 formulation that crispness is 9 panelists voted for WF2 due its taste and crispness during eating and Overall mouth feel. The formulation WF1 was less acceptable due to less in crispness and not good in overall mouth feel and WF3 was not acceptable due to high bran quantity made panelists to chew hard. So WF2 was an acceptable Wheat bran flakes by the panelists and the WF2 formulated fake were used for the further proximate analysis and storage process (12).

HEDONIC RATING OF FOOD PRODUCT

Basaveshwar Engineering College (Autonomous), Bagalkote

Department of Biotechnology

Sensory evaluation of Wheat Bran Flakes

NAME:

Attributes	WF1	WF2	WF3	
Color (Appearance)				
Taste				
Mouth feel				
Aroma				
Texture				
Acceptability				
Preference				

3.4 Proximate analysis of the wheat bran flakes

Proximate Analysis is a method to determine the values of macronutrients present in the food samples. generally, those values are being declared or displayed as nutritional facts which are shown usually on the labels of final food products, but they are also being resolute during the process of production. The beginning of the nutritional analysis instigates back in 1861 and since then it has been continuously advanced and altered .

3.4.1 Estimation of carbohydrate in wheat bran flakes

The phenol-sulphuric acid method was adapted in the estimation of the total carbohydrate present in the wheat bran flakes. This method detects the all classes of the carbohydrate counting mono, di, oligo and polysaccharides. Among many other colorimetric methods for

the carbohydrate estimation, the phenol-sulphuric acid method is the reliable and easiest method. It has been used in the measuring of the neutral sugars present in the glycoproteins, proteoglycans, glycolipids and oligosaccharides . This method has been widely used due to its simplicity and sensitivity procedure.

In this phenol-sulphuric acid method the sample was grinded finely into powder and then 0.1g of sample was taken and diluted to 100ml of distilled water and was vortexed so that the sample undergo agitation to lead to homogenization of the sample before it was used for the estimation. Then glucose standard was prepared for 25 micro gram/100 ml this standard was added to the first 6 test tubes in the amount of 0, 0.2, 0.4,0.6, 0.8, 1.0 ml than distillate water was added in first 6 test tube amount of 1,0.8,0.6,0.4,0.2,0 ml. The seventh test tube was added with 1ml of prepared sample . Then in each test tube 1ml of 5% of phenol reagent and 5 ml of concentrated sulphuric acid was added. Then the test tubes were incubated for 20 minutes in the room temperature after the completion of the incubation time the solution in test tube turned in to orange brown colour and then the OD (optical density) was read through the colorimeter at 490nm and through help of graphical representation the total carbohydrate was estimated of the food sample(26).

Calculation

Carbohydrate%= (Unknown OD× Dilution factor×100)/weight of the sample------Eq. (1)

Fig 3.16: Colorimeter apparatus

3.4.2 Estimation of protein in wheat bran flakes

Protein was estimated through the Kjeldahl method which principle convey that the food is digested with the strong acid so that the food releases nitrogen which can be determined with

the suitable titration technique. The amount of the protein present in the food is then calculated from the amount of the nitrogen concentration present in the food sample.

The first step in protein estimation was of preparation of the sample. Sample was grinded finely into powder than was used for the estimation process. The Kjeldahl method was adapted for estimation of protein of the product this Kjeldahl method mainly has three steps such as digestion, neutralization and titration process. The digestion of the food sample got initiated with the adding 0.5g of copper sulphate, 5g of potassium sulphate to the digestion tubes and sample was weighed up to 0.1g than next 15 ml of Concentrated sulphuric acid was added to the digestion tubes carefully by using the PPE(personal protective equipment) precaution .The digestion tubes were placed in the digestion chamber for around one and half hour in the digestion step digestion converts the any nitrogen in the food into ammonia and other organic matter such as carbon dioxide and water. Ammonia gas does not get liberated in acid solution because ammonia is in form of ammonium ion which binds to the sulphate ion and thus remain in the solution. After the digestion is completed the digestion tubes are left for cooling at room temperature. Next the second step neutralization was carried out where the solution present in digestion tube is made alkaline by the addition of sodium hydroxide(NaOH), which in turn converts ammonium sulphate into ammonia gas. The ammonia gas that is formed is than liberated from solution and moves out of digestion flask an than into the receiving flask - which contains an 2% of 50 ml boric acid. The low pH of the solution in receiving flask converts the ammonia gas into ammonium ion and concurrentlychanges boric acid to borate ion.Than the last step is titration in this step the nitrogen content was estimated by titration of the formed ammonium borate with concentrated hydrochloric acid using and indicator methyl red for confirming of the end point. The concentration of hydrogen ions needed to reach end-point is equivalent to concentration of the nitrogen that was food sample (27).

Calculation:

Nitrogen (N) %= (Burette reading)×0.014/weight of the sample × 100--------Eq. (2)

Protein % = N% × 6.25(protein factor).----------Eq. (3)

Fig 3.17: Kjeldahl apparatus

3.4.3 Estimation of moisture content in wheat bran flakes

Moisture content is the amount of water present in the food sampl**e.** Moisture content is used in a very wide range of technical and scientific areas ,and is expressed in form of a ratio, which can range from 0 that is completely dry to the value of the materials absorbency at the level of saturation.

In the estimation of the moisture content in Wheat bran flakes the standard oven method was adapted where initially the sample was powdered finely through the help of Piston and mortar. The petri dish was kept in oven for 10 minutes to ensure there is no water content and dish is completely dry, than the petri dish was taken out from the oven a cooled in the desiccator after cooling the empty weight of dish was weighed and noted down that is W1.Than 10g of sample was added into petri dish weight was noted down that is W2 and then petri dish was kept in oven at 105 °C with lid open until the weight is obtained constant it took 4 hours for the complete loss of Moisture from food sample. The petri dish lid was closed while taking out of oven after 4 hours and placed in desiccator to cool completely, then after cooling of petri dish the weight was noted down that is W3 and the Calculation was carried out (According to FSSAI) (27).

Calculation: (W2-W3)/(W2-W1) × 100----------Eq. (4)

W1- weight of empty petri dish

W2- weight of petri dish with sample

W3- weight of petri dish after drying

Moisture content of the food sample

Fig 3.18: Hot air oven

3.4.4 Estimation of total ash and acid insoluble ash of wheat bran flakes

Ash contentof the food sample states to inorganic residue remaining after the ignition or the total oxidation of the organic matter present in the food sample. The inorganic residue primarily contains primarily of the micronutrients which are present in food sample.

Acid insoluble ash content is the proportion of the food sample that is not hydrolysed by the acid and is not properly volatilised by the incineration of this Acid Insoluble Residue present in the food sample

The total ash content of wheat bran flakes was estimated through following procedure that is the empty weight of crucible was weighed that is W1 than 5g of finely powdered sample was added into crucible after addition of sample the weight was noted that is W2.The crucible was kept in muffle furnace at temperature of 520 degree °C for 4 hours, after 4 hours of ignition the ash is formed in the crucible than crucible is taken out the muffle furnace and completely cooled in the desiccator. Then cooled crucible is weighed that is W3. Then calculation is carried out. Then the acid insoluble ash is performance by taking the crucible which has ash in it. The crucible is added with 5ml of 5N HCl and standing time is given for 2 minutes than the solution present in the crucible is filtered through the ash less filter paper after filtration the filtrate along with the filter paper is kept in the same crucible and placed in the muffle

furnace at temperature of 520 °C for 4 hours and after ignition crucible is cooled in desiccator and crucible is weighed that is W4 than calculation was carried out (26).

Calculation: Total ash= (W3-W1)/((W2-W1)(100-M)) × 10,000 ---------Eq. (5)

W1- weight of the empty crucible

W2- weight of the crucible with sample

W3- weight of the crucible after ignition

M- Moisture content of the food sample

Calculation: Acid insoluble ash (AIA) = (W4-W1)/((100-m)(W2-W1)) × 100-----Equation(6)

W1- weight of the empty crucible

W2- weight of the crucible with sample

W4- weight of the crucible after 8 hours of ignition

M- Moisture content of the food

Fig 3.19 Muffle furnace apparatus

3.4.5 Estimation of fat and acidity of extracted fat(AEF) of wheat bran flakes

Total fat of the wheat bran flakes was estimated through Soxhlet procedure and Acidity of extracted fat was assessed through titration method. The Acidity of extracted fat indicates the rancidity of the of the food sample. According to FSSAI (Food safety and standards authority of India) has claimed that the Acidity of extracted fat of baked foods should not be more than 1.5%.

The total fat present in wheat bran flakes was estimated by Soxhlet procedure that is first the empty thimble weight was weighed (T1) and then 10g of finely powdered sample was added in the thimble and thimble was weighed (T2). Then petroleum ether was the organic solvent used for the extraction process. Petroleum ether is non-polar solvent which forms an homogeneous mixture and is of low cost. Boiling point of petroleum ether is 70 °C .The empty weight of round bottom flask was noted down(RBF1).Than petroleum ether is added to the round bottom flask. The flask is attached to an extractor and followed with condenser. The thimble is placed insideextractor and round bottom flask is placed on heating mantle at 70 ºC. The petroleum ether boils in the round bottom flask and get vaporized and condensed back through extractor and then back to round bottom flask. The Soxhlet process was made to run for completion of the twenty cycles and then the fat get settled at the bottom of round bottom flask and the flask is weighed(RBF2).Then for Acidity of extracted fat process goes hand in hand with the fat extraction process where the fat present in the round bottom flask is added with the 50 ml of 97% ethanol than phenolphthalein indicator is added up to 8 drops and titrated against 0.1N NaOH until the solution turns pink which is the end point of the titration. the amount of NaOH consumed was noted down and then calculation was carried out(28).

Calculation: Total fat = (T2-T1)/(RBF1-RBF2) × 100---------Eq.(7)

T1-Weight of empty thimble

T2-Weight of thimble with sample

RBF1- Weight of empty the round bottom flask

RBF2- Weight of the round bottom flask with fat(After extraction)

Calculation: AEF = (TV× Normality of NaOH×28.2)/(RBF2-RBF1)×100------Eq.(8)

TV- Titration value

RBF1- Weight of empty round bottom flask

RBF2- Weight of round bottom flask with fat (After extraction)

Fig 3.20: Soxhlet Apparatus

3.4.6 Microbiological analysis of wheat bran flakes

Microbiological analysis of the food product is the use of biological, molecular, chemical and biochemical approaches for the identification, enumeration and detection of the microorganisms in a material (e.g., Food or drink). It is often applied to spoilage and diseases causing microorganisms. The microbial analysis plays an important role due to many of the microbes are harmless to the human health, others can lead to serious problems also. They have the complete capacity to spoil the food product, cause disease and also introduce the toxin in food. The importance of microbiological testing is to quickly identify the contaminants and treat them before they undergo irreversible damage and effect the human health.

In the microbial analysis of wheat bran flakes The total plate count method was adapted where total bacterial concentration is known after incubation of 24 hours. The nutrient agar medium was used where the media was prepared as per following that is media was prepared

for 250 ml with the composition 0.5g of yeast extract, peptone 1.25g, sodium chloride 1.25g, agar 3.75g, beef extract 0.25g and 250ml of distilled water. The petri plates, prepared media was sterilized in auto clave for 1 hour at 15 Lb pressure and then the 1 gram of powdered sample of wheat bran flakes was taken and serially diluted in the 10 ml of sterilized distilled water of ratio 10^{-1},10^{-2} and 10^{-3}.

And then the media and petri dish were made to cool in laminar air flow and then 1ml of serially diluted sample was added to the three petri dish respectively and then the media was added and was gently shaken so that sample and the media was mixed uniformly than the media was allowed to cool and get solidified than kept in incubator at 32 degree temperature for 24 hours and then the results were noted down and the number of colonies were counted manually after completion of the incubation period(29).

Calculation: CFU/m= (Number of colonies × total dilution factor)/vol of the culture plated in ml----------Eq (9).

CFU= colony for unit

3.5 Shelf-life study of the wheat bran flakes

Shelf-life is the time period within which the food product retains its all-quality characteristics which is suitable for the human consumption and does not have any adverse effect on health when consumed. In a food industry, shelf life of a food product is time amid the packaging of the food product and the time when it becomes improper for consumption under few environmental conditions. There are many factors that effects the Shelf-life of the food product such as firstly Intrinsic factors such as the raw materials, composition of the product (additive added), total acidity and available oxygen. Second factor is extrinsic factors such as exposure to sunlight, temperature, humidity and damage in packaging.

In the Shelf-life study of the wheat bran flakes the product was manufactured and warehoused or stored in the air tight container at room temperature. The Shelf-life study was carried out for one month where the parameters involved in the Shelf-life study were Moisture content, Acidity of extracted fat, Taste and crispness of the wheat bran flakes. The Shelf-life study was supported out twice in a week and the results were noted down

For the moisture content of Wheat bran flakes the standard oven method was adapted, Acidity of extracted fat was estimated through Soxhlet and titration method and sensory attributes were involved in taste and crispness of the wheat bran flakes. The purpose of the

shelf-life study is to benefit the consumers to feel safe while eating food product and to convey information about the food product.The shelf-life of the food product should only be considered valid only if the product has been purchased intact and undamaged manner. Consumers must always follow the manufacturers' instructions and guidelines on the storage of the food product, particularly the temperature and use of the product after opening the lid(28).

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Sensory evaluation of wheat bran flakes (WF2)

Fig. 4.1: Sensory evaluation

Fig.4.2: Panellist’s during sensory evaluation

The sensory evaluation of the first formulation was carried out that is WF1.It contained the more amount of wheat flour that is 40g and 20g of wheat bran per 100g of the composition other ingredients were added in same quantity .Total 15 panelists were involved in the sensory evolution where the attributes were rated as below form Table. No. 13 the panelists mainly did not appreciate the taste as it was slight bitter and crispness was not up to the mark and the texture was good. Out of 5 attributes the panelists only liked the aroma of the first formulation and other attributes did not match up to the expectation .so the mean acceptability is 2.7 out of 5 scale according to the panellist's decision of the formulation WF1.From the graph mentioned that is Fig.4.1.5.Indicates that the aroma attribute was liked and accepted more and the overall acceptability of the first formulated product is less. The total mean of respective attributes where the appearance was 3.26,Taste was 2.66,Mouth feel was 2.60,Aroma was 4.06, Texture was 3.60.

Table 4.1: Sensory evaluation scores of the formulation WF1

Attributes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total sum	Mean
Appearnce	4	3	3	4	3	4	3	2	3	4	3	2	3	4	4	49	3.26
Taste	3	2	3	3	2	2	3	3	3	2	3	3	2	3	3	40	2.66
Mouth feel	3	3	3	2	2	3	2	3	2	3	3	2	3	2	3	39	2.60
Aroma	4	5	4	4	4	4	4	4	3	4	4	4	4	4	5	61	4.06
Textrure	4	3	4	3	4	4	3	4	4	3	4	4	3	3	4	54	3.60
Acceptability	3	3	2	3	3	3	2	3	2	3	2	3	3	3	3	41	2.73

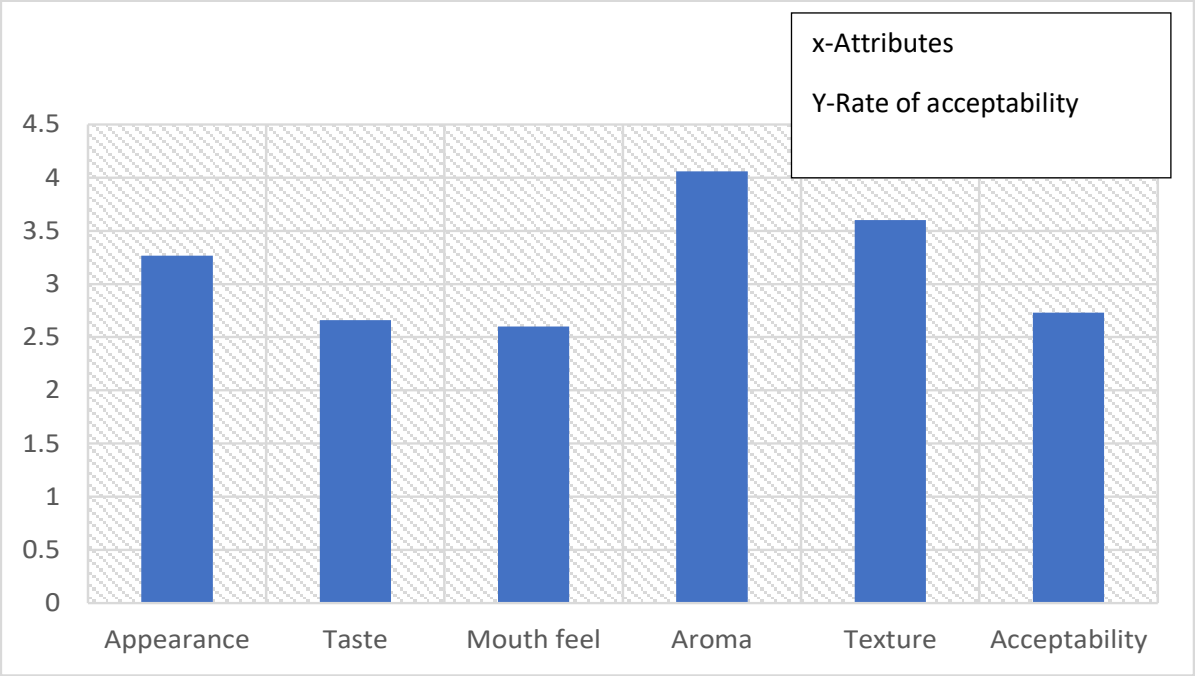


Fig.4.3: Graphical representation of the attributes and acceptability rate of WF1

In the second formulation that was WF2 the equal amount wheat flour and wheat bran that is 30g each for 100g of composition of the wheat bran flakes was added.This formulation was accepted the most among the three formulations this was justified through the following tableNo.14 and graphical representation Fig.4.4 all the attributes were more liked by the panelists due to good mouth feel and crispiness of the flakes the Overall Acceptability is 4.53 for the scale of 5.The respective total mean of the attributes were appearnace was 4.26,taste was 4.60, mouth feel was 4.33,aroma was 4.6,texture was 4.066 these total mean of the attributes were for the scale of 5. The same sample for taken for the further proximate analysis of flakes.

Table 4.2 : Sensory evaluation scores of formulation WF2

Attributes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total sum	Mean
Appearnce	4	5	4	4	5	5	4	4	4	5	5	5	4	5	5	64	4.26
Taste	5	5	5	5	5	4	5	4	4	5	5	4	4	5	4	69	4.60
Mouth feel	4	4	4	4	5	4	5	5	4	5	4	5	4	4	4	65	4.33
Aroma	4	5	4	4	4	4	4	4	3	4	4	4	4	4	5	61	4.06
Textrure	4	4	4	4	4	4	4	4	4	5	4	4	3	5	4	61	4.06
Acceptability	5	4	5	4	5	4	5	4	4	5	4	4	5	5	5	68	4.50

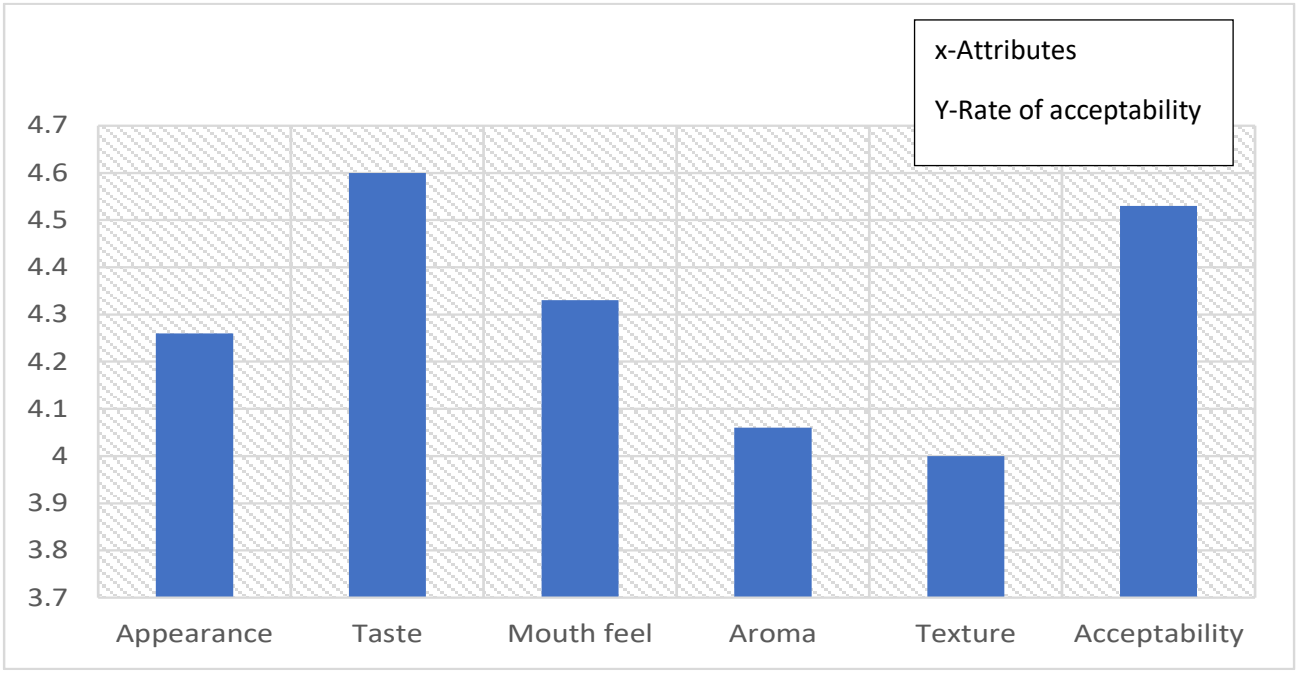


Fig.4.4: Graph represents the attributes and acceptability rate of WF2

The third formulation mainly consists of the more quantity of wheat bran and less amount of wheat flour that is 40g and 20g respectively. The panelists liked the texture and the aroma more than other attributes in the flakes the mouth feel was the lowest rated attribute because the taste of the bran was left out more at the end of the sensory and even the bran particles were left out at the end of chewing made panelists to dislike the overall mouth feel .The following table No and Fig mainly shows the overall acceptability rate that is 3.06 the respective total mean of the attributes were Appearance was 3.133,Taste was 3.200, Mouth feel 2.600,Aroma was 3.666, Texture 3.533.

Table4.3: Sensory evaluation of the formulation WF3

Attributes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total sum	Mean

Appearnce	3	3	3	3	4	3	3	3	3	3	4	3	3	3	3	47	3.13
Taste	3	3	3	4	3	3	3	3	3	4	3	3	4	3	3	48	3.20
Mouth feel	3	3	3	2	2	3	3	3	2	2	3	3	2	2	3	39	2.60
Aroma	3	4	3	4	5	3	4	2	3	4	4	5	4	3	4	55	3.66
Textrure	3	4	4	4	3	3	4	3	4	3	4	3	3	4	4	53	3.53
Acceptability	3	3	2	3	3	3	3	3	3	3	3	4	3	4	3	46	3.06

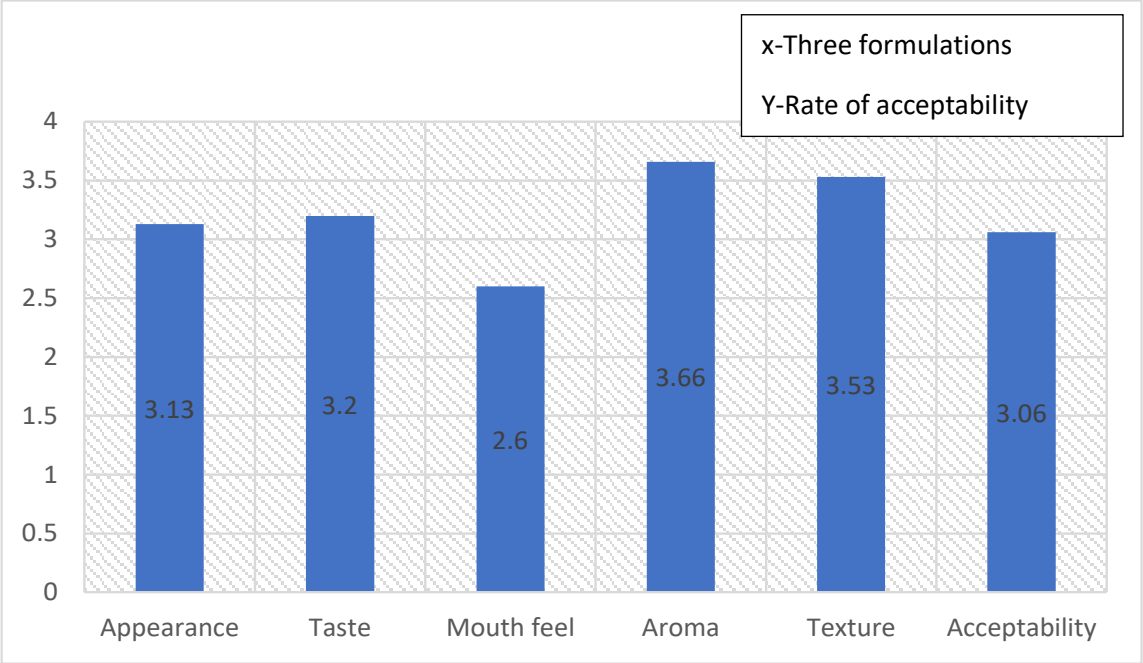


Fig.4.5: Graph represents the attributes and acceptability rate of WF3

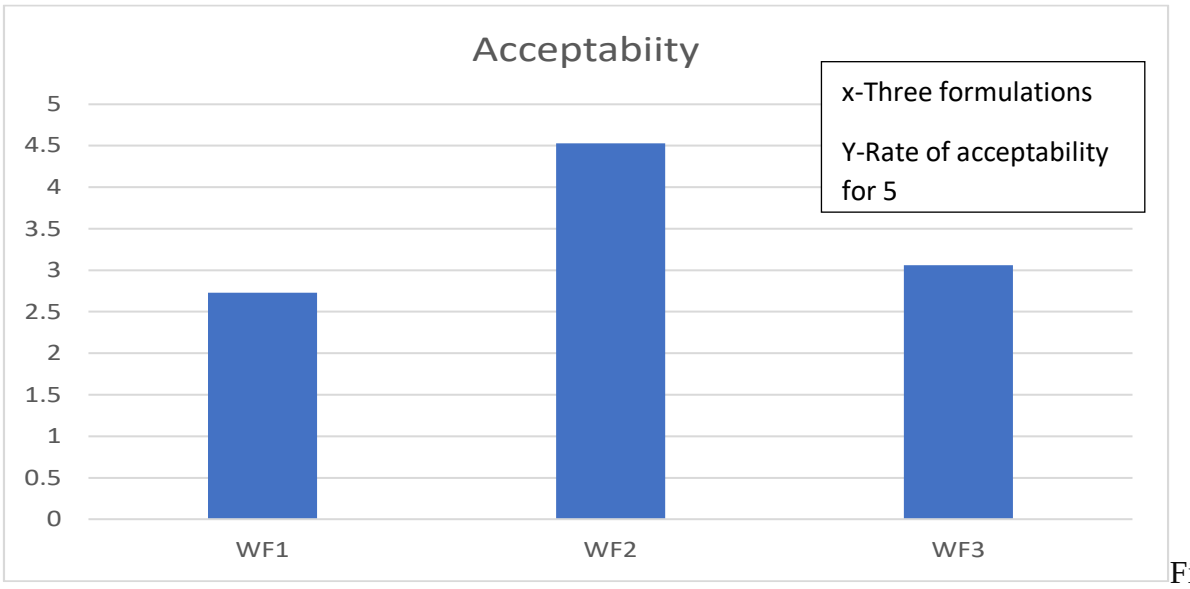


Fig.4.6: Comparison of all the acceptability of the three formulations (WF1,WF2 and WF3)

In the Fig.4.6 The Acceptability Comparison of the three formulations were compared where the first formulation(WF1) having wheat flour quantity more was having the acceptability rate of 2.7. The second formulation (WF2) having both wheat bran and wheat flour in equal amount was most accepted among the three formulations of having acceptability rate of 4.53. And the third formulation(WF3) having wheat bran in more quantity had the acceptability rate of 3.06. Based on the graphical representation of the sensory evolution the second formulation was accepted by the panelists regarding of all the attributes and WF2 was taken for further proximate analysis.

4.2 Carbohydrate Estimation of wheat bran flakes (WF2)

The carbohydrate estimation was carried out through phenol-sulphuric acid method where the standard glucose was used as a standard the standard Tabular column is as represented in Table. No.4.4.In the Paper (26) the standard procedure adapted was the phenol-sulphuric acid method for carbohydrate estimation.

Table4.4: Standard glucose tabular column

SL.NO.	Standard	Concentration µg/ml	Distilled water	Phenol(5%)	Sulphuric acid		OD at 490nm
1	0	0	1	1 ml	5 ml	**Incubation for 20 minutes at room temperature**	0
2	0.2	20	0.8				0.22
3	0.3	40	0.6				0.4
4	0.4	60	0.4				0.58
5	0.5	80	0.2				0.76
6	0.6	100	0				0.92

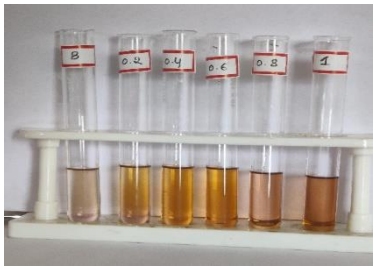
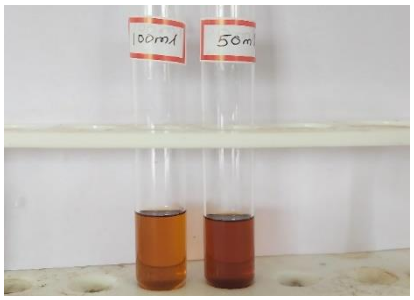


Fig.4.7: Prepared standard glucose



4.8: incubation at room temperature for 20min

Fig.4.9: OD read through Colorimeter

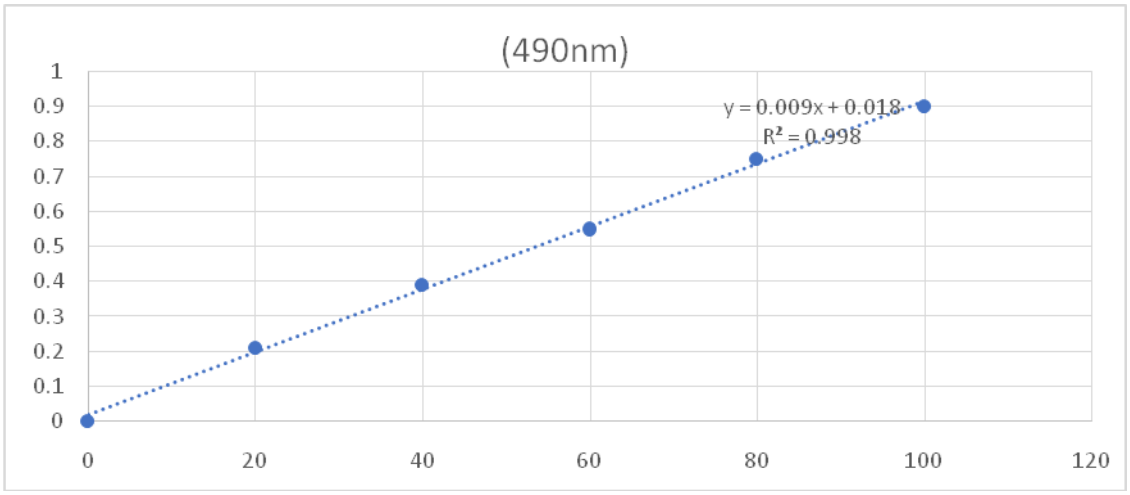


Fig 4.10 Standard graph of glucose for phenol-sulphuric acid method of carbohydrate estimation

Slope	Intercept	Sample OD	Carbohydrate%/100g
0.0091	0.0229	0.79	84.29

Table 4.5 : Total carbohydrate percentage in 100g of the wheat bran flakes

The total carbohydrate present in the 100g of the wheat bran flakes is 84.29% the flakes are rich in the carbohydrate. According to the paper referred (9) the total carbohydrate is 86.53% for 100g of the flakes. The wheat flakes have the vital content of the carbohydrate where keeps the stomach full for long time period and a good source as the cereal breakfast option.

4.3 Estimation of protein in wheat bran flakes (WF2)

The protein estimation was carried out by adapting the Kjeldahl method where the steps like Digestion, Neutralization and Titration was carried out of wheat bran flakes. In the Fig. was the stage of completion of the digestion process where all the polypeptides present in sample are broken down in to the simpler chemicals such as carbon dioxide and ammonia after the completion of digestion the solution turns to ocean blue indicating the completion of process. Then in the Fig4.3.2. The Neutralization process was carried out where the sodium hydroxide was used as alkali and the borate ion captures the ammonia gas and the colour changes to brown colour than after neutralization process is completed the transparent solution is obtained and further in Fig. 4.3.3. Indicating the process of titration with concentrated hydrochloric acid with methyl red the end point was pink in colour and the amount of hydrochloric acid used up during Titration was noted down(27) .

Calculation: Nitrogen %= ((2.34)×0.1×0.014/0.13)× 100

= 2.52%

Protein % = 2.52 × 6.25(protein factor).

= 15.75%

In the above referred papers that is (Rene, 2019) the total protein estimated was 16.5% for 100g of the sample. In the protein estimation of wheat bran flakes the percentage of nitrogen was 2.52% and the total protein is 15.75% for 100g sample of wheat bran flakes. So, the paper the protein present in 100g of wheat bran ranges from 14% to 17% so the obtained protein content falls between the range of standard value. The percentage of protein content varies according to the different protein rich ingredients added as the part of food product.

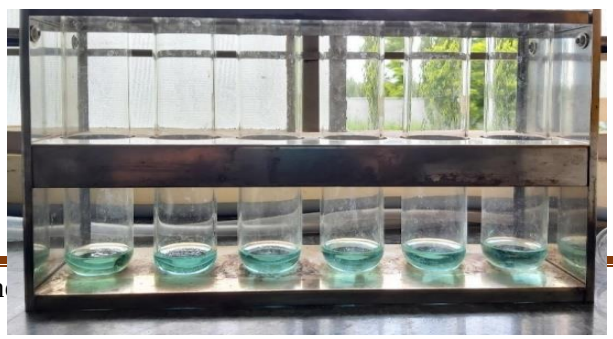


Fig.4.10: Digestion process of the sample

Fig.4.11: Neutralization process through Kjeldahl apparatus

Fig.4.12:Titration process of the sample

4.4 Estimation of moisture content in wheat bran flakes (WF2)

The moisture determination of wheat bran flakes was carried out with the standard oven method its self where the petri dish with sample and lid open was kept in the oven for 4 hours and Calculation was carried out(27)

Calculation: M=((W2-W3)/(W2-W1)) × 100

W1- 88.933

W2- 98.869

W3- 98.220

Moisture %= ((98.869-98.220)/(98.869-88.933))×100

= 6.53%.

The standard Moisture is 7% t0 9% according to AOAC the obtained Moisture of the wheat bran flakes of WF2 is 6.54% which falls within the range of the standard value the moisture content of the sample plays vital role where if value is more or out of the specification than the product will not be able to retain its quality characteristics and the degradation of the product will be in short time period and high Moisture content results in the growth of the microbes.

Fig.4.13: Petri dish with sample placed in hot air oven

Fig.4.14: Petri dish kept in oven

4.5 Estimation of total ash and acid insoluble ash (WF2)

The total ash and acid insoluble ash were valued in a continue procedure where the Sample was ignited for 4 hours in Total ash estimation and the same ash was dissolved in Concentrated HCl and filtered through ash less filter paper and then was ignited for 4 hours to get acid insoluble ash of the sample(According to AOAC).

Calculation: Total ash= (W3-W1)/((W2-W1)(100-M)) × 10,000

W1- 73.254

W2- 78.209

W3- 73.287

M- 6.53

Total ash= (73.287-73.254)/((78.209-73.254)(100-6.53)) × 10,000

Total ash = 0.72%

Calculation : Acid insoluble ash (AIA) = (W4-W1)/((100-m)(W2-W1)) × 100

W1- 73.254

W2- 78.209

W4- 73.256

M- 6.53

Acid insoluble ash (AIA) = (73.256-73.254)/((100-6.53)(78.209-73.254)) × 100

AIA= 0.063%

According to the AOAC that is association of official analytical chemists contains technical specifications and criteria designed to be consistently used for the analysis of the food samples as per the AOAC standards the maximum total ash is 1% and acid insoluble ash is 0.1% of the baked food products. So the obtained total ash and acid insoluble ash of the wheat bran flakes is 0.72% and 0.063% respectively which are within the standard values. So, the product is acceptable in regarding of total ash and Acid insoluble ash parameter.

Total ash

Fig 4.15: Crucible with sample kept in muffle Furnace

Fig 4.16: Ash formed after ignition for 4 hrs

Acid insoluble ash

Fig.4.17: Filtration of ash with Conc.HCl

Fig. 4.18: Ignition along with ash less paper

Fig 4.19: Ash formed after ignition of 4 hours along with ash less paper

4.6 Estimation of total fat and acidity of extracted fat(WF2)

The fat content and the acidity of extracted fat was carried out with the Soxhlet process and the values were expressed in the form of percentage. The Calculation of the total fat and Acidity of extracted fat is as mentioned below(35)

Calculation : Total fat =((RBF2- RBF1)/T2-T1))× 100

T1- 1.110

T2- 11.110

RBF1- 139.500

RBF2- 139.5496

Total fat =((139.5486-139.500)/(11.110-1.110))×100

Total ash = 4.96%

Calculation: AEF = (TV× Normality of NaOH×28.2)/(RBF2-RBF1)

TV- 1.5

RBF1- 139.500

RBF2- 141.7354

AEF=(1.5×0.05×28.2)/(141.7354-139.500)

AEF= 0.9164%

The total Fat percentage obtained was 4.96% for 100g of the sample according to the standard AOAC the fat percentage ranges from 4% to 6% per 100g of the flakes so as the obtained Total fat of the wheat bran flakes is within the range of the specification the product is acceptable in terms of total Fat percentage. The AEF according to FSSAI standards the maximum AEF is 1.5% where the obtained AEF of the wheat bran flakes is 0.916% for 100g of the sample so even the AEF is within the standard specifications and AEF range was acceptable.The total fat and AEF plays an important role in the rancidity aspect so as the both Total fat and AEF are not out of specification so no chances of causing rancidity.

Fig. 4.20: Soxhlet process for extraction of fat

Fig.4.21: Titration process for AEFestimation

4.7 Microbial analysis of wheat bran flakes(WF2)

While many of the microbes are harmless to the human health but there are few microbes which causes serious helath issues to human and microbes can induce the toxin and sopil the food and cause disease to the human health. Due to this reason the microbial analysis is carried to avoid the irreversible action of the microbes. The microbial analysis was carried out with the pour plate method through serial dilution procedure and the incubation was carried out of 48 hours and the results were observed(50).

Table 4.5 : Microbial analysis of W2 formulation on nutrient agar media

Samples	**10^{-1}**	**10^{-2}**	**10^{-3}**
Number of colonies	1	0	0
CFU/ml	1×10^{-1}	0	0

The microbial growth was oberved only in the 10^{-1} dilution of the perti plate where only one colony was observed .In the dilutions 10^{-2} and 10^{-3} no colonies were observed.

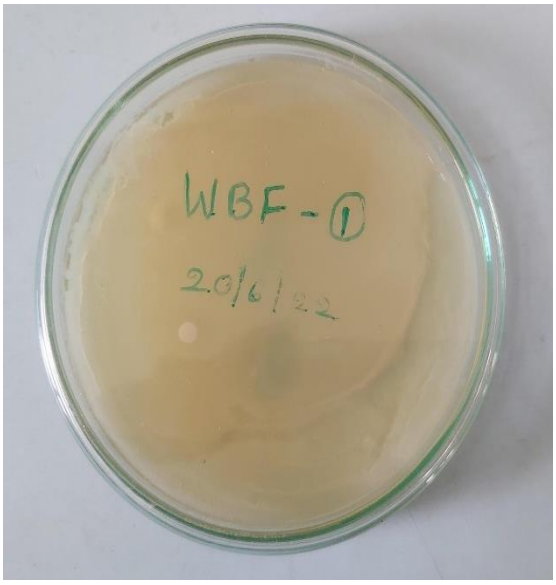


Fig 4.22: WF2(10^{-1}) on NA

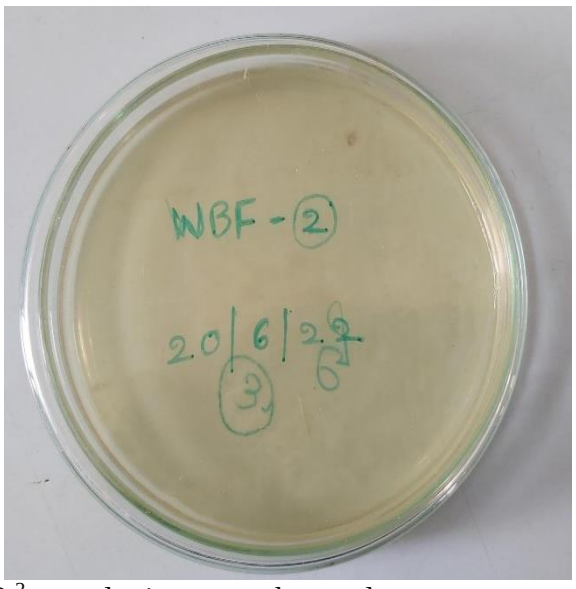


Fig 4.23: WF2(10^{-2}) on NA

Fig 4.24: WF2(10^{-3}) on NA

4.8 Shelf-life study of wheat bran flakes

Shelf-life study was carried for totally 32 days and the Shelf-life study were carried out for alteratnative 4 days with the four attributes such as Moisture, Acidity of extracted fat, taste and crispness of the flakes. During the Shelf-life study it was observed that the 1st and 4th day had a Moisture differences of just 0.29% the moisture content were 6.53 and 6.82 respectively. The Acidity of extracted fat remained same for the 1st and 4th day and taste, crispness were retained exactly as the day of manufacturers or flakes were made. Next in up comping 8th and 12th that is second Week the acidity of extracted fat got raised for 0.01% when compared to previous days. The moisture content was 7.01% and 7.35% for 8th and 12th day respectively and there Was no change in the tatse and crispness of the flakes. During the 16th and 20h day the moisture content increased that is 7.51% and 7.92% respectively the acidity of extracted fat,tatse and crispness remained same for the second Week of study. During the 24h and 28th day of study the moisture content was 8.01% and 8.45%, AEF was 0.07% and 0.08%, there was a observeable change in the tatse and crispness where the tatse was slight bitter and flakes were got softer and was not much crispier as the previous days.On the last day of the Shelf-life study that is on 32nd day the moisture was 8.82%, Acidity of extracted fat was 0.08% and the tatse was bitter at the end of the mouth feel and flakes were less crisp. The moisture content and the acidity of extracted fat were within the standard specifications through out the Shelf-life study.

Table 4.6 : Shelf-life study of wheat bran flakes with the attributes -Moisture, AEF, crispness and taste.

Week	Day	Moisture (%)	Acidity of extracted fat(%)	Taste	Crispiness
Week 1	1	6.53	0.05	Good	Brittle
	4	6.82	0.05	Good mouth feel	Brittle
Week 2	8	7.01	0.06	Good	Brittle
	12	7.35	0.06	Good	Brittle
Week	16	7.51	0.06	Good	Brittle

3	20	7.92	0.07	Good	Brittle
Week 4	24	8.01	0.07	Little bitter	Soft
	28	8.45	0.08	Little bitter	soft
Week 5	32	8.82	0.08	Little bitter	Easy to break

4.9 Nutritional comparison of the flakes

Table 4.7: Nutrient comparison of the wheat bran flakes and other flakes

Sl. No	Nutrients% for 100g	Wheat bran flakes	Other flakes
1	Carbohydrate	84.29 %	82-86%
2	Protein	15.75%	12-16%
3	Fat	4.96%	0-6%

In the above Table 4.7 the nutrient comparison of the wheat bran flakes and other flakes can be observed where the nutrient content falls in the same margin of both the flakes. But the difference is that the others flakes present in the market have the components such as sugar and maida which are not healthy to the human body but the wheat bran flakes produced do not contain maida as well as sugar .The sugar is replaced with the jaggery, maida is replaced with wheat flour the replaced components adds the beneficiary ingredients to the human body which makes the flakes more nutritious.

CHAPTER 5

CONCLUSION

The wheat bran flakes product was developed with the three formulations with different varying ingredients that is wheat bran and wheat flour along with seeds the formulation developed and coded as WF1,WF2 and WF3. Firstly, the sensory evaluation of the product was carried out with 5 scale hedonic method and WF2(wheat bran 20g,wheat flour 40g) formulation was rated the most liked formulations compared to other two formulations. Proximate analysis was carried out where the total carbohydrates obtained for 100g was 84.29% , total Protein was 15.75%, moisture content was 6.53%, Total ash was 0.72%, acid Insoluble Ash was 0.063% Total fat was4.96% per 100g of the wheat bran flakes and acidity of extracted fat was 0.916% . The microbial analysis was carried out where only one colony was found in the first formulation that is WF1 and no colonies were found in other two formulations. In the Shelf-life study reveals that of the wheat bran flakes the study was carried out for 32 days where the parameters such as moisture content and acidity of extracted fat were within the standard specifications even at the end day of the Shelf-life study. The present study concluded that the wheat bran flakes were rich nutrients good breakfast cereal for human consumption.

FUTURE PROSPECT

In the further phase of the project the nutritional content of the wheat bran flakes can be increased more with addition of the antioxidants and vitamins. The wheat bran flakes can be produced in large scale also further modifications can be carried out for improving the nutrient margin as well as the flavour of the product. The cost estimation of the product can also be improved.

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DEPARTMENT OF BIOTECHNOLOGY

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CERTIFICATE

This is to certify that the project entitled "Analysis of combined effect of Malabar spinach fruit extract and Wheat grass powder on the developed bread" is a work carried out by Miss. Jyoti Basavaraj Arabi bearing USN: 2BA20FBT02, in partial fulfillment for the award of M.Tech Food Biotechnology, in the Department of Biotechnology, Basaveshwar Engineering College (A), Bagalkote, affiliated to Visvesvaraya Technological University, Belagavi during the academic year 2021-2022. To the best of our knowledge, the work reported in this dissertation has not submitted by the candidate elsewhere for the award of any other degree. It is certified that all corrections, suggestions indicated during internal assessment have been incorporated in the report.

Prof. Preeti S Kumarmath	Dr. Jayachandra S Y	Dr. Bharathi S Meti	Dr. S S Injaganeri
Guide	Coordinator	HOD	Principal

Examiners **Signature with date**

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2) Dr. Preeti. S. Kumarmath

3) Dr. S. K. Jigajinni

ABSTRACT

Developing the new products that has benefits have become the current trend in the market. The customers are facing issues due to improper balance of nutrition in day to day life.Hence in this study the new bread with extract of Malabar spinach fruit which is rich with protein and wheat grass powder which can treat certain diseases has been developed in order to benefit the consumers with nutrients.Wheat flour and maida flour are used to make different combinations to create bread. Four different flour combinations are prepared, keeping the wheat grass and malabar fruit extract constant. After developing the bread it is analyzed for its nutritional value. Carbohydrates, protein, fat, total ash, moisture and sensory analyses are performed on the developed bread. The most preferable combination is 50 gm wheat flour + 50 gm maida flour with other raw materials mentioned in the figure from 3.3 to 3.10. This combination have shown good value as a nutritional content, such as for carbohydrates 69 μg/ml, protein 18 %, fat 7.5 %, moisture 14.6 %, total ash value 6.32 % and in the preference test, most of the panelist have given their preference for this combination. A nutritional rich bread was developed to over come the bad effects of refined flour bread.

CHAPTER 1

INTRODUCTION

The world is consuming increased amount of refined foods which have only carbohydrates devoid of other nutrients, these are causing many health problems in people. These processed foods are known to be less nutrient because of their bran removal during the process. Such example include the bread made of refined flour known as maida flour has many problems when consumed daily in the large amount. As the refined flour is less in fiber content and other nutrients, it leads to constipation and irregular bowel movements. This study is to benefit the health of the consumers and reap the benefits of the natural occurring active compounds which have a beneficial effects on the human body.

Fig 1.1: Wheat grass plant

Wheat grass (*Triticumaestivum)* is local to southwest Asia and the Mediterranean area and is cultivated practically all around the world. It is a tufted grass plant of Poaceae family. The plant arrives at up to the level of 30 to 90 cm. The leaves of the plant are level or to some degree rolled, have long and thin leaves bloomed from a single seed which has a broadness up to 1.3 cm. A sum of twenty types of *T. aestivum* recorded overall generally out of which eight types of wheat grass are purportedly found in India. Wheat grass is known for its therapeutic properties during past and in present as they boost the health of humans and animals [1].

Wheat grass juice has a rich wellsprings of dietary fibre which helps to loose weight and it contains immune system essential compounds such as Vitamin C, A and E. Wheat grass is a gluten free juice which is consumed widely around the world. Wheat grass is known to increase the enzyme activity of the liver which speed up the

reactions of breaking down the food and toxins in our body. Wheat grass is anti-inflammatory agent and has a healing properties such as infection in the digestive system and drastic stomach ache [2].

Wheat grass chlorophyll is high in oxygen content which help to wash out the toxins or stored drugs from the body. Wheat grass also help to forestall the tooth decay in the humans when taken in a limited quantity per day. The skin issues such as dermatitis can be prevented by consuming the juice of wheat grass which is also known as green blood juice. Wheat grass juice is considered to be the best juice when compared to other herbal juices such as carrot and beetroot juices [3].

Wheat grass has 70% of the chlorophyll in it, as a result of this it is known as green blood. The green blood has some antimicrobial properties and it forestall the sicknesses in the people by capturing the development of unfavorable growth of microorganisms which are answerable to certain skin or body infections. The bio-flavonoid such as vitamin C that occur in wheat grass juice can inhibit the growth of *Candida albicans* [4].As a substitute to the chemical antibiotics , it is necessary to explore and utilize the naturally occurring antibacterial plants which had shown their antibacterial activity against many infection caused by bacteria [5].

The identical structure of Hemoglobin from human body and Chlorophyll from wheat grass have an effective way of building the blood from Chlorophyll derivatives in the body when consumed daily with limited quantity. From the study it is also confirmed that anemic animals have enhanced RBC cells when treated with chlorophyll derivatives [6]. The service of buying the Wheat grass tablets is available in the market due to its astonishing nutrition and therapeutics properties.

Malabar spinach is a common name for *Basella* plant. *Basella alba* and*Basellarubra*are the two conventional restorative plants with family *Basellaceae.* The difference between these two plants can be seen through their stem colour(*Basellarubra*has red stem and *Basella alba* has green stem) and the length of the leaves(*Basella alba* have leaf width of 21.4 cm whereas*Basellarubra* have leaf width of 14.8 cm) [7].These plants are known for their medicinal properties in Indian medicine system to treat inflammation in the body and also used for treating the

modern problem i,e constipation. These herbs contains the plenty of vitamins such as niacin, vitamin C. Whole *Basella* plant is known for its rehabilitate functions with the properties of anticancer, antioxidant, anti-ulcer, anti-cholesterol and others [8].

Fig 1.2: *Basellarubra*plant

Malabar spinach fruits are high in total dietary fibre content i.e, 32.52 gm per 100 gm, in which soluble dietary fibre is 12.34 gm/100 gm and insoluble dietary fibre is 20.16 gm/100 gm [9]**.**

Basellarubra and *Basella alba* both have antibacterial properties and has shown gigantic potential in androgenic, ulcer treatment, cytotoxic,, focal sensory system (CNS) depressant action, cell reinforcement, nephroprotective and so forth [10].

Fig 1.3: *Basellarubra* fruits

A red pigment known as Betalains is extracted from the fruits of*Basellarubra*which have numerous utilization in the field of nutraceutical and food industries. These industry can use natural food colors from betalains an alternative to synthetic food colors. This pigment retention will be greater at 0°C. It is heat sensitive pigment [11].

*Basellarubra*is considered as a medicinal plant based on various experiments conducted on it and its success rate. As hematological parameters are important to the livings beings which includes RBC, WBC and other parameters, there is a evidence of

increased cells of WBC, by changing the capacity of oxygen carried by the blood [12].

In this study the nutritional rich bread was prepared considering the benefits of both Wheat grass and Fruit juice of *Basellarubra*in the view to aid benefits to the people.

CHAPTER 2

REVIEW OF LITERATURE

Health benefits and Nutritional value of wheat grass

The wheat grass plant is a rich source of many vitamins, minerals and have many health benefits such as Anti-diabetic, Antioxidants shown in the table 2.1.

Table 2.1 Nutritional value and health benefit of wheat grass plant

Sl.No	Plant	Study	References
1	Wheat grass	Activities such as Anti-diabetic, Antioxidant, Anti-ulcer, Anti-cancer etc	ShailjaChoudhary*et al.* 2021 [1]
2	Wheat grass	Rich source of minerals such as calcium, phosphorous etc and Vitamins such as A , B, K etc	Rajesh Mujoriya*et al.*, 2011 [2]
3	Wheat grass	Growing and harvesting methods of Wheat grass	Abe Tullo, 2021 [3]
4	Wheat grass	Anti- fungal property	Vishnu Prasanna *et al.*, 2016 [4]
5	Wheat grass	Mineral uses	Deshwal V K *et al.*, 2018 [5]
6	Wheat grass	Improvement in diabetes, Rheumatoid Arthritis and inflammatory conditions	SatyavatiRana *et al.*, 2011 [6]

The important contents of wheat grass is vitamins, such as Vitamin A will help in curing the black spots around the eyes and in improving eye sight [1]. Sickness such as common cold and Bleeding gums can be prevented by consuming wheat grass that has more amount of vitamin C when compared to orange [2]. The composition of Red Blood cells and Wheat grass juice has a similarity in structure, hence it helps in

increasing RBC cells in the body [3]. The skin diseases such as Gangrene, skin itching, eczema has shown to reduce when the patients has been given the dose of wheat grass juice on daily basis [4]. The mineral such as iron in the wheat grass helps in reducing the laziness and insomnia and calcium will prevent easy bone breakage and potassium will be used by the body to reduce the depression and dementia [5]. The other benefits of the green blood tonic includes preventing kidney stones, hair loss, fatigue and has shown the improvement in diabetes etc [6].

Morphology of*Basella* species and uses of their pigments

Malabar spinach is a edible plant of the family *Basellaceae*. The leaves, stem and fruits of this plant have healing properties due to its nutritional content. The benefits of this plant is shown in the table 2.2.

Table 2.2 Morphology trait of*Basella* species and their pigments

Sl.No	Plant	Study	References
7	Malabar spinach	Morphology trait	Bianca Elena Tanase*et al*., 2020 [7]
8	Malabar spinach	Morphology trait	Ajay Chaurasiya*et al.*, 2021 [8]
9	Malabar spinach	Stability of betalains	SandopuSravan Kumar *et al.*, 2016 [9]
10	Malabar spinach	Thermal stability of betalains	Shu-Mei Lin *et al*., 2010 [10]
11	Malabar spinach	Thermal stability of betalains	Pawar N *et al.*, 2018 [11]
12	Malabar spinach	Hematological parameters	Deep ShikhaSonkar*et al*., 2012 [12]

The vine spinach also known as Malabar spinach is the common name for *Basella*species, But the difference can be made through the pigment present in the veins of the leaves [7]. The red pigment known as Betalains are present in *Basellarubra* whereas the Chlorophyll pigment is retained in the veins of *Basella alba*

[8]. The temperature at which the betalains are highly degraded is 120°C, were as the temperature at which there is a slightly damage in the nutritional value of the extract was 0°C [9]. The pigment retention is greatly effected by its internal pH concentration [10]. It is observed that under the dark conditions and at temperature 4°C the pigment retained was the highest, in comparison with the other temperature [11]. The aqueous extract of the *basella* fruit showed increased amount of RBC cells in the animal studies[12].

Anti-microbial and Anti-oxidant property of Wheat grass

The wheat grass powder has shown to suppress the microorganisms due to its anti-microbial property. The other properties of the wheat grass has shown in the table 2.3.

Table 2.3 Anti-microbial and Anti-oxidant property

Sl.No	Plant	Study	References
13	Wheat grass	Wheat grass capsules as Anti-inflammatory agent	Dina Anwar A *et al.*, 2015 [13]
14	Wheat grass	Anti- microbial property	MeghaMurali*et al.*, 2016 [14]
15	Wheat grass	Secondary metabolites action	Yogesha Mohan *et al*., 2013 [15]
16	Wheat grass	Saponins, phenol action	LadusinghRajpurohit *et al*., 2015 [16]
17	Wheat grass	Anti-microbial action against E.coli bacterial strain	Anu Agarwal *et al.*, 2015 [17]
18	Wheat grass	Anti-microbial action	ElifAkbas*et al.*, 2017 [18]
19	Wheat grass	Sensitive species to wheat grass	Yang F *et al.*, 2001 [19]
20	Wheat grass	Antioxidant analysis methods	Satarupa Roy *et al*., 2018 [20]

21	Wheat grass	Anti-bacterial property	AthulSundaresan*et al*., 2015 [21]
22	Wheatgrass	Antioxidant property	Sunil Kulkarni *et al.*, 2006 [22]

In the market the capsules of wheat grass are available as the anti-inflammatory agent and as a better immunity capsules[13]. The growth and multiplication of various micro-organisms is suppressed or inhibited or even destroyed by the Anti-microbial agent present in the wheat grass [14]. The Indian medicinal wheat grass plant has increased sensitivity against number of bacterial strains due to its secondary metabolite actions [15]. Phenol, Saponins are responsible for this action as they contain biological effects such as Anti-inflammatory and Anti-microbial effects [16]. The bacterial strains such as *E.coli* and *K. Pneumonia* had shown increased zone of inhibition when the highest concentration of wheat grass extract was added into the Mullar Hinton agar plates [17]. The concentration at which the Anti-microbial action starts in wheat grass juice is 2 μL [18]. The most sensitive species that is suppressed from wheat grass is *bacillus* species[19]. Some of the antioxidants present in the wheat grass was identified through AOAC methods and other by HPLC method[20]. The wheat grass extracted from hexane solvent shows the highest inhibition property on the bacterial species [21]. The antioxidants in juice extract will prevent the cell damage and have a role in Anti-ageing process [22].

Treatment of several diseases by wheat grass

Wheat grass has shown to treat some of the diseases. The pigment of the wheat grass has a treatment property. The diseases which are treated with wheat grass has shown in the table 2.4.

Table 2.4 Wheat grass in treatment of several diseases

Sl.No	Plant	Diseases	References
23	Wheat grass	Thalassemia	Marwaha K *et al*., 2014 [23]
24	Wheat grass	Thalassemia	Chauhan M, 2014

			[24]
25	Wheat grass	Iron deficiency	SuneethaRunjala*et al.*, 2013 [25]
26	Wheat grass	Ulcer	Singh N *et al*., 2012 [26]

Thalassemia is genetic disorder is which the hemoglobin will not carry sufficient amount of oxygen. This leads to the decreased life span in the patients of the thalassemia [23]. The chlorophyll of the wheat grass extract is implicated in the clinical studies to increase the induction of HbF in the patients who have a deficiency of HbA. Hence HbF compensate the HbA in the thalassemia patients [24]. The iron deficiency is a hematological condition in which the circulation of blood have often low number of Red blood cells. Daily consumption of 100 ml of freshly extract wheat grass juice has shown increased amount of blood by 3g/dl [25]. The ulcer developed in the stomach of rats was cured by the wheat grass extract which showed anti-ulcer activity [26].

Products of wheat grass

The different types of products are made from the wheat grass plant. The wheat grass is incorporated into the plain product to increase its nutritional value. These products are shown in the table 2.5.

Table 2.5 Wheat grass products

Sl.No	Plant	Products	References
27	Wheat grass	Muffins	RashidaRahmana*et al.*, 2015 [27]
28	Wheat grass	Cucumber cooler and Orange blast with wheat grass	Gautam S *et al.*, 2018 [28]
29	Wheat grass	Biscuits	SuneethaRunjala*et al.*, 2016 [29]

Muffins is a sweet bakery product which is spongy due to its porous structure. Muffins developed with 5 percentage wheat grass showed the bio-active compounds and is overall accepted by the panelist as compared to the other muffins with the combinations (10 % and 15 %) [27]. About 20 ml of wheat grass juice in cucumber cooler (123 code number) and orange blast (423 code number) has shown the most acceptability rate as compared with other combinations ranging from 121 to 125 and 421 to 425 code number [28]. The biscuits accumulated with 40 gm of wheat grass powder with cashews has shown 6mg of iron and 18 gm of protein in 100 gm of biscuit [29].

Nutritional information of Malabar spinach and its consumption rate

*Basellarubra*and *Basella alba* are rich in dietary fibre, vitamin, minerals and their consumption is increasing in the world due to their nutritional content. The benefits of this plant is shown in table 2.6.

Table 2.6 Nutritional information of Malabar spinach

Sl.No	Plant	Study	References
30	Malabar spinach	Nutrients such as vitamins, minerals, dietary fibre etc.	Sravan Kumar *et al.*, 2015 [30]
31	Malabar spinach	*Basellarubra* characteristics	Singh M *et al.*, 2016 [31]
32	Malabar spinach	Malabar spinach consumption rate	AdeneganAlakinde*et al.*, 2014 [32]
33	Malabar spinach	Vitamin A	Marjorie J Haskell *et al.*, 2004 [33]
34	Malabar spinach	Drying methods	Oladele O *et al*., 2009 [34]

The *Basella alba* contains low calories of 90 Kcal for 100 gm dried *Basella alba* leaves. Vitamins such as C is 74 mg and total dietary fibre was found to be 32 gm in

100 gm of *basella*leaves [30]. The edible portion of *Basellarubra* contain energy of 23 Kcal and have some antimicrobial effect [31]. In Nigeria, consumption of these leaves is higher in women (54.9 %) than the men (40.6%) from the age 15 and above [32]. The 60 days supplement of Malabar spinach leaves given to Bangladeshi men had shown the increased amount of retinol from 1.15 to 1.24µmol/L [33]. The people now know the importance of Malabar spinach and are trying to preserve them thorough out the year by drying them with several methods which include sun drying, shade and oven drying [34].

Anti-inflammatory and Anti-microbial properties

*Basellarubra*and *Basella alba* have shown the anti-inflammatory properties in various experiments. Their Anti-microbial properties are shown in the table 2.7.

Table 2.7 Anti-inflammatory and Anti-microbial properties

Sl.No	Plant	Study	References
35	Malabar spinach	Anti-inflammatory activity on albino rats	Krishna Chaitanya, 2012 [35]
36	Malabar spinach	Anti-microbial activity on *E.coli, A.niger*etc	Sen K *et al.*, 2010 [36]
37	Malabar spinach	Anti-microbial activity on *S.aureus*and *E.coli*	Oyewole O. T *et al.*, 2012 [37]
38	Malabar spinach	Anti-microbial activity on *A.flavus*and *Bacillus cereus*	Gabriel OlaniranAdegoke*et al*., 2017 [38]
39	Malabar spinach	Anti-inflammatory activity	Roshan Adhikari *et al.*, 2012 [39]

The medicinal *Basella* plant is known for its antimicrobial and other bacterial suppressing properties. In the study where the albino rats having inflammation due to some factors , the Malabar spinach cotton pellet was implanted to the inflammation part where it has shown to decrease the amount of inflammation about 50 % when the

amount of Malabar spinach is 250 mg/kg [35]. About 50 µl/ml concentration of Malabar spinach leaves had shown maximum zone of inhibition (14.3mm) in ethanolic extract against *E.coli* [36].The minimum inhibitory concentration for stem of the malabar spinach is 50 mg/ml for *E.coli* and 100 mg/ml for *S.aureus*[37]. The different phytochemicals such as terpenoids, saponinsetc present in stem, fruit and leaves have shown the anti-microbial properties [38]. It is dose dependent activity, which means the higher the doze, the higher the inhibition or destruction of microorganisms [39].

Malabar spinach fruit pigments and their stability

The red pigment from the*Basella*plant can be used as alternative to the synthetic food color. Apart from its rich colour, it is also a great source of nutrition. The effect of light, temperature on the pigment is mentioned in the table 2.8.

Table 2.8 Pigments and their stability

Sl.No	Plant	Study	References
40	Malabar spinach	Pigment as a colourant in food modules	SandopuSravan Kumar *et al.*, 2020 [40]
41	Malabar spinach	Extraction of red-violet fruit	Sravan Kumar *et al*., 2014 [41]
42	Malabar spinach	Stability of pigment anthocyanin	Eliana Ferreira Ozela*et al*., 2007 [42]
43	Malabar spinach	Effect of light, pH of pigment	Reshmi S K *et al.*, 2012 [43]

The betalain pigment from the Malabar spinach has a wide uses in the food model systems. They are used in colouring the banana shakes, lemon juices [40]. The pigment is extracted by adding water to the 25 gm deseeded fruits of malabar spinach by crushing it using mortal and pestle [41]. The anthocyanin stability is studied by its colour stability in the presence of sunlight at 25°C for two days. The absorbance is

measured at 520 nm every 2 hours to know whether the pigment had degraded with the effect of light on it [42]. The pigment is not destroyed when it is placed in the dark room. Due to light absorption in the pigment the degradation tends to be faster when compared with no light effect on betacyanin [43].

Proximate analysis methods

The food products are analyzed for their nutritional value by various chemical methods. The methods are mentioned in the table 2.9.

Table 2.9 Proximate analysis methods

Sl.No	Method	Study	References
44	Anthrone method	Carbohydrates	DevindraShakappaBuckan, 2015 [44]
45	Kjeldahl method	Protein	Hsiaoling Wang *et al.*, 2016 [45]
46	Kjeldahl method	Protein	Hanne K. Maehre*et al.*, 2018 [46]
47	Soxhalet method	Fat	Sofia Pombal*et al.*, 2017 [47]
48	Moisture method	Water activity	Young W *et al*., 2016 [48]
49	Descriptive test	Importance of sensory analysis	Tiziana Maria Sirangelo, 2019 [49]
50	Triangular, descriptive test	Sensory properties	Edgar Chambers, 2019 [50]
51	Preference test	Comparison between the food samples	Fabian DominicusMihafu *et al.*, 2020 [51]

The bio molecule such as carbohydrates is essential for the energy source. Glycemic carbohydrates are analyzed by the anthrone method in which sample reacted with

anthranol turns into dark blue colour which is measured by UV- spectrophotometer at 620 nano meter [44]. Kjeldahl method is used to analyse the food sample for its protein contents which are in micro gram quantities [45]. Protein test is carried by other methods such as amino acid analyses method, The lowry method, bradford method etc. Among these methods the highest rate of protein is analyzed by kjeldahl method [46]. The soxhalet method is not only used in food nutrition testing, it is also used in testing the products of pharmaceuticals. The estimation of Fat content of the food sample is carried with AOAC (1995) method [47]. The different methods applied in analysis of moisture include drying methods namely oven drying, freeze drying etc, the chemical methods used is Karl Fischer titration and other indirect methods include microwave absorption method. The total ash of food sample is easily calculated when the sample will be burnt fully through muffle furnace, ash is formed [48]. The food quality is generally determined by its taste. The good or bad smell, taste of the food is easily detectable through our sensory organs. The new product developed has to go through some of the sensory analysis methods from which they are acceptable in the market [49]. Sensory analysis is a mixture of physiology, psychology, nutrition, medicine, chemistry etc, the combinations of these will give the overall acceptability of the product [50]. The different types of sensory analysis include the Triangular test, descriptive test, paired comparison test, hedonic test etc which will give the importance of one or more food samples [51].

2.1 OBJECTIVES

1. To develop the new product of bread.
2. To analyse nutritional content of the developed bread.
3. To evaluate the developed bread through sensory evaluation.

CHAPTER 3

MATERIALS AND METHODS

3.1Raw materials

The material required for the preparation of bread is easily obtained from nearest stores in the market, such as wheat flour, refined flour, wheat grass powder, malabar spinach fruit extract, milk, sugar, water, oil, salt and yeast, which were shown in figures from 3.1 to 3.10.

Source of raw materials: The raw material such as Wheat-grass powder is obtained from the Amazon online shopping and the red coloured fruit were obtained from the 3 month old plant of Malabar spinach which had grown in the area of 51 sector, Navanagar, Bagalkote. About 150 gm of fresh fruits were taken to extract the juice from the fruit for biochemical analysis and the remaining was stored in the freezer at the temperature of 0°C for further use.

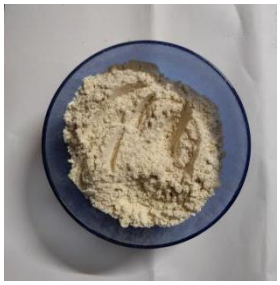

Fig 3.1:Wheat flour

Fig 3.2: Refined flour

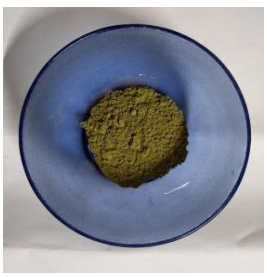

Fig 3.3: Wheat Grass powder

Fig 3.4: Fruit extract of Malabar spinach

3.2 Composition of raw materials for preparation of bread

Table 3.1: Raw materials composition

Composition of flours in gm	Wheat grass powder in gm	Malabar spinach berry extract in ml	Sugar in gm	Milk in ml	Yeast in gm	Salt in gm	Oil in ml	Water in ml
100 gm of maida flour (Control)	0	0	10	5	10	2	1	10
25 gm of wheat flour + 75 gm of maida flour	5	5	10	5	10	2	1	10
50 gm of wheat flour + 50 gm of maida flour	5	5	10	5	10	2	1	10
100 gm of Wheat flour (100 %)	5	5	10	5	10	2	1	10

The different compositions were prepared by mixing the raw materials which are given in the table above. The mixing was done at the room temperature and the method to develop the bread is given below.

.

3.3 Process of making good textured bread

Two main ingredients i.e., Sugar and yeast were dissolved in water at growing temperature such as 32°-35°C

Ingredients from table 3.1 are mixed in a bowl and solution of yeast was added to it

Mix and keep the dough in an airtight bowl and cover with butter paper around it

Proofing or fermentation of dough (minimum 1 hour)

Now dough will have Yeasty aroma and was transferred to kitchen surface where surface is smooth and pressed with hands

Keep the smooth dough in mould which is of rectangular shape and cover it with butter paper

Second fermentation (30 to 40 mins)

The Mould containing dough was transferred into the preheated oven at 210° C for 30mins

Bread was developed which had a light green colour

Fig 3.11: Flow chart to develop fortified bread

3.4 The developed bread

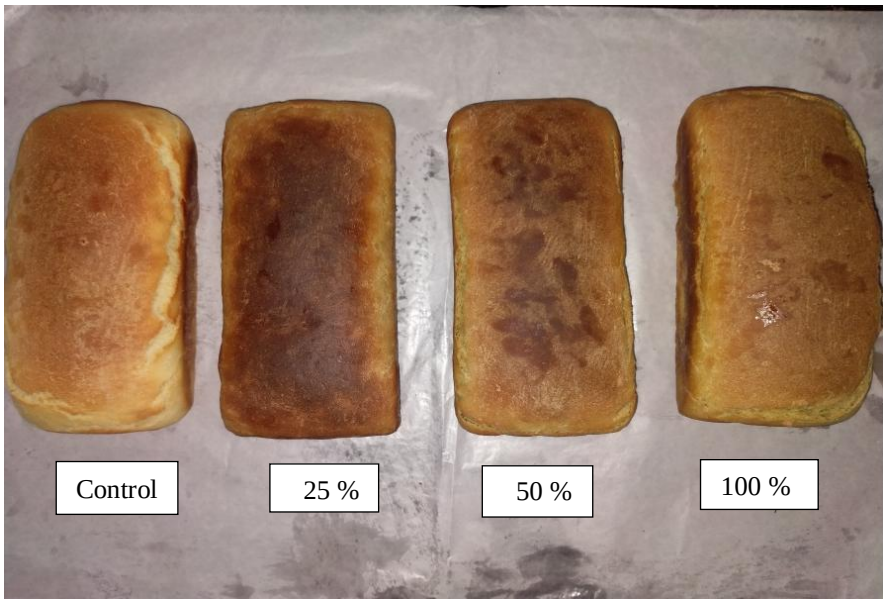

Fig 3.12: Four different compositions of bread

Compositions:

1. The bread taken as a control was prepared only from the single flour particularly the maida flour without addition of the wheat grass powder and Malabar berry extract.
2. The bread developed by adding 25 gm wheat flour and 75 gm refined flour is referred as 25 % in the study.
3. The bread developed by adding 50 gm wheat flour and 50 gm refined flour is referred as 50 % in the study.
4. The bread mentioned as 100 % was made entirely by wheat flour where as the bread contains the two important raw materials such as Malabar fruit extract and wheat grass powder as an additional components.

3.5 Proximate analysis of the developed bread

3.5.1 Carbohydrate analysis of developed bread by Anthrone method

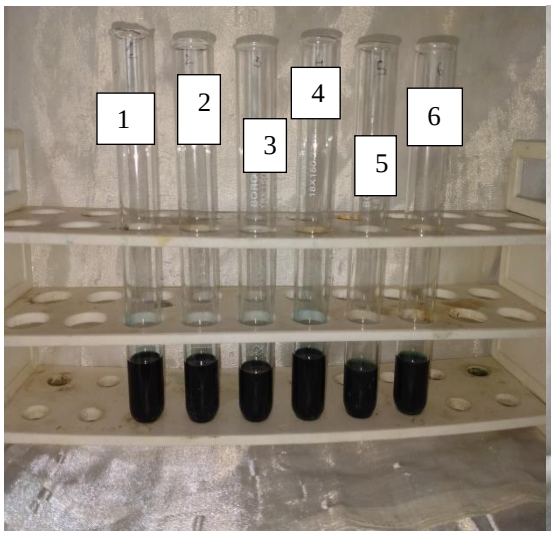

Fig 3.13: Standard glucose concentration of 10 mg/10 ml

Fig 3.14: Unknown samples

Principle: The furfural is formed when the sample is dehydrated by conc.H_2SO_4. The blue colour solution is formed when anthranol condenses the carbohydrates. Using colorimeter at 620nm maximum absorption is measured.

Chemicals required: Anthrone reagent, H_2SO_4, Standard glucose

Procedure:

1. Glucose stock solution was prepared by dissolving 10 mg of glucose in 10 ml of distilled water. The glucose solution was added in the test tube according to the table 3.2.
2. Test tube no. 1 was regarded as blank were as from test tube no. 2 to tube 6 are with varying concentration of standards required to create the standard curve. Test tubes no. 7 to 10 are the unknown samples.
3. Now anthrone reagent of 4 ml was added to each test tube separately.
4. Aluminium foil is used to cover the test tube and was incubated in Boiling water bath for 10 min at 90°C.

5. Test tubes were cooled to low temperature and was measured for their absorption at 620 nm.
6. Absorbance vs. µg/ ml glucose graph is prepared using graph.

Table 3.2: Test of carbohydrates by Anthrone method

Sl. no	Standard glucose (ml)	Concentration in (µg/ml)	Distilled water (ml)	Anthrone reagent (ml)	10 mins in Boiling Water Bath	OD at 620nm
1	0	0	1	4		0
2	0.2	20	0.8	4		0.28
3	0.4	40	0.6	4		0.44
4	0.6	60	0.4	4		0.65
5	0.8	80	0.2	4		0.82
6	1	100	0	4		0.95
7	UK(1)	-	0	4		**0.53**
8	UK(2)	-	0	4		**0.62**
9	UK(3)	-	0	4		**0.75**
10	UK(4)	-	0	4		**0.66**

Calculation: The amount of glucose present in the bread is estimated by plotting a standard curve.

3.5.2 Protein estimation of developed bread by kjeldahl method

- The protein content of the developed bread was estimated by Kjeldahl method which is an AOAC method.

Chemicals required: Copper sulphate, Potassium sulphate, Sulfuric acid, Sodium hydroxide, Boric acid, HCl.

Procedure

1. Sample of bread was prepared by weighing 0.1 gm of bread using weighing balance.

2. Next step was to weigh the K_2SO_4 up to 5 gm and 0.5 gm of $CuSO_4$.
3. The kjeldahl method include three main steps to calculate the percentage of protein, they are,

a) **Digestion**- 0.1 gm of bread sample is placed in a kjeldahl flask and previously weighed K_2SO_4 and $CuSO_4$ was added to the same flask. Amount of Sulfuric acid added was 15 ml to the same flask. The combined reaction of these chemicals would bring the nonvolatile ammonium sulphate from the sample.

b) **Neutralization**- In this step the acidity of the digest is decreased by adding 50ml of water to it and Sodium hydroxide to decrease the acidity of sulfuric acid.

c) **Distillation**- In 2 % of boric acid solution the ammonia formed from previous reactions was distilled, using indicators such as methyl red. From this distillation the colour of the solution was turned yellow from pink colour,

4. The final step was to titrate the solution with 0.1 N HCL where the colour of the solution would turn into pink if there was a presence of protein in the solution. The volume at which the colour changes will give the calculation for percentage of protein.

Calculation:-

$$\textbf{Grams of N in a sample} = \frac{V_{ml} \times 0.1 \times 14}{1000}$$

$$\textbf{\% N} = \frac{\text{Grams of N in sample}}{\text{Grams of sample}} \times 100$$

$$\textbf{\% P} = \text{N \%} \times 6.25$$

3.5.3 Fat estimation of developed bread from soxhlet extraction method

Fig 3.15: Socs plus apparatus

The fat from the food sample is dissolved in the solvents such as petroleum ether because of the insolubility of the fat in the water. The main principle used here is the reflex action of the liquid sample at the suitable temperature.

Chemicals required: Petroleum ether

Procedure:

1. The beakers of the socs plus were weighed using weighing balance and their weight were recorded.
2. About 3 gm of the bread sample of every combination was weighed separately and were placed in the different thimbles.
3. The thimbles were placed in the thimble holder correctly and were placed into their respective beakers.
4. About 50-60 ml of petroleum ether was added into the beaker.
5. The beaker with the sample was inserted into the socs plus apparatus and inlet tube of water is connected to tap water and the water flow from the outlet.
6. The socs plus apparatus is switched on and the temperature was raised to 90°C.
7. The sample was runned for 45 mins.

8. Now the knob of the condenser was closed to run the sample for 10 mins at high temperature of 100°C to evaporate the solvent and collected inside the condenser.
9. Cool the beaker and take it out from the apparatus .
10. The thimble from the beaker is also removed to weight the beaker only.
11. The Beaker weight was considered as the final weight to calculate the percentage of the fat present in the sample.

Calculation:

$$\text{Fat percentage} = \frac{\text{Final weight- Initial weight}}{\text{Sample weight}} \times 100$$

3.5.4 Moisture analysis of developed bread sample by oven method

Moisture is very important aspect in the food preservation. The moisture is bounded to the compounds of the sample. Hence the nutritional value of the sample is depend on the percentage of the moisture in it.

Materials required: Sample, oven, weighing balance.

Procedure:

1. The amount of 5 gm freshly prepared bread sample was weighed using weighing balance.
2. Preheat the oven and transfer the sample into the preheated oven where the temperature is adjusted to reach the temperature of 110°C.
3. Sample was heated for 1 hour.
4. Now the sample was taken out from the oven and was cooled for 10 mins.
5. The sample was weighed and its value was recorded.
6. Now the sample is again placed in the oven for 30 mins and was taken out to weigh and record the value.
7. The above steps were done repeatedly until the weight of the sample was remained constant to ensure the moisture has evaporated from the sample.

Calculation:

$$\text{Moisture \%} = \frac{\text{Weight of wet sample - Weight of dry sample}}{\text{Weight of wet sample}} \times 100$$

3.5.5 Total ash analysis of developed bread using muffle furnace

Ash is considered as very important aspect in food quality analysis. It gives the amount of quality and purity of the sample. Burning the bread sample at suitable temperature will give the inorganic matter that has retained after burning the organic matter.

Materials required: Muffle furnace, Dried sample, weighing balance

Procedure:

1. The sample was preheated to remove the moisture content in the sample.
2. The number of crucibles were taken were four.
3. About 4 gm of different combinations of sample were weighed using weighing balance and placed in the crucibles.
4. The muffle furnace was heated up to 550°C.
5. Now the samples along with the crucibles were placed inside muffle furnace using tongs and hand gloves.
6. The samples were placed for 2 hr to char.
7. The organic matter present in sample get burnt and only inorganic matter will be remained .

Calculation:

$$\text{\% Total ash content} = \frac{\text{Weight of the ash}}{\text{Weight of the sample}} \times 100$$

3.6 Sensory analysis

The examination of the food sample based on its appearance, taste, colour, flavor, smell etc using the senses of the body is known as sensory analysis. The acceptance and rejection of the newly developed food product will be based on this test.

Fig 3.16: Bread samples for sensory analysis

Fig 3.17: Tasting of sample by panelists

Preference test: This is the food testing method were different combinations of the food sample were taken to differentiate one sample from the other based on their properties. Ranking the samples from the most preferred to the least preferred option was given to the panelists. The number for the most preferred food sample was given is 4, were as for the least preferred food sample the number was given is 1. Ties were not permitted in this test.

Preference test module

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),
BAGALKOTE
DEPARTMENT OF BIOTECHNOLOGY

PREFERENCE TEST

NAME:

SAMPLE:

DATE:

Instructions:

- The sample coded with alphabets are placed in front of you, rank the coded samples according to your preference.
- 4 for most preferred and 1 for least preferred

Preference test table: To be filled according to the panelist desire

Code of the sample	Preference (4 to 1)
A	
B	
C	
D	

REMARKS:

In the above table the coded samples are referred as below

A- Control

B- 25% composition

C- 50% composition

D- 100% composition

Hedonic test: In this food sample testing method, the five point scale has been used in this study. The five points used in this test are given below

- Like a lot
- Like a little
- Neither like nor dislike
- Dislike a little
- Dislike a lot

This test include assigning the number from 1 to 5 to the testing sample based on its properties and panelists satisfaction. The number 5 is given to like a lot option, 4 for like a little, 3 for neither like nor dislike, 2 for dislike a little, 1 for dislike a lot. The attributes used in this test were

1. Appearance

2. Aroma
3. Taste
4. Sweetness
5. Texture

Hedonic test module

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),
BAGALKOTE
DEPARTMENT OF BIOTECHNOLOGY

HEDONIC RATE (SCORE CARD) TEST

NAME:

SAMPLE:

DATE:

Instructions:

- The sample coded with alphabets are placed in front of you, taste the coded samples and tick the right mark how much you like or dislike the sample characteristics.

Hedonic test table: To be filled according to the panelist desire

Number to be given to the sample	Factors	Appearance	Aroma	Taste	Sweetness	Texture
5	Like a lot					
4	Like a little					
3	Nether like nor dislike					
2	Dislike a little					
1	Dislike a lot					

REMARKS:

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Carbohydrates by Anthrone method

Concentration of carbohydrates are obtained from the OD versus Concentration calibration curve

Table 4.1 Carbohydrates by anthrone method

Unknown sample Test tube no.	**Concentration (µg/ml)**
7 (Control)	**48**
8 (25 %)	**57**
9 (50 %)	**69**
10 (100 %)	**60**

From the above graph the concentration of the unknown sample is calculated.

The unknown sample 3 which has a 50 % composition of flours have shown the highest concentration of carbohydrates of 69 µg/ml when compared with others.

4.2 Protein by kjeldahl method

Table 4.2: Percentage of protein present in different combinations of bread

Composition of flours	**V_{ml} (ml)**	**P %**
100 gm of maida flour (Control)	0.38	3.3
25 gm wheat flour + 75 gm maida flour	2.069	18.10
50 gm wheat flour + 50 gm maida flour	2.12	**18.55**
100 gm of wheat flour	2.08	18.2

Results- The bread made from the combination of 50 gm wheat flour and 50 gm maida flour has highest amount of protein in it is 18.55 % when compared to the other combinations. The lowest protein content in present in Control is 3.3 %.

4.3 Fat by soxhlet extraction method

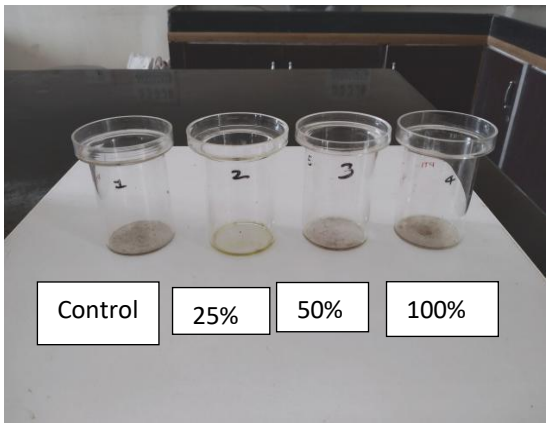

Fig 4.1: The beakers of soxhlet apparatus holding the fat content after extraction method

Table 4.3: Percentage of Fat present in different combinations of bread

Combinations of flours	**Beaker weight+ fat (gm)**	**Beaker weight (gm)**	**Fat (%)**
100 gm of maida flour (Control)	83.29	82.11	4
25 gm wheat flour + 75 gm maida flour	83.65	82.42	6.5
50 gm wheat flour + 50 gm maida flour	83.87	82.64	**7.5**
100 gm of wheat flour	83.09	81.80	7

Results- From the above table, The highest amount of fat present in the bread sample is seen in the composition of 50 %. Highest fat percentage is 7.5 %. The other samples contains less than 7.5 % fat concentration in the samples.

4.4 Moisture analysis by oven method

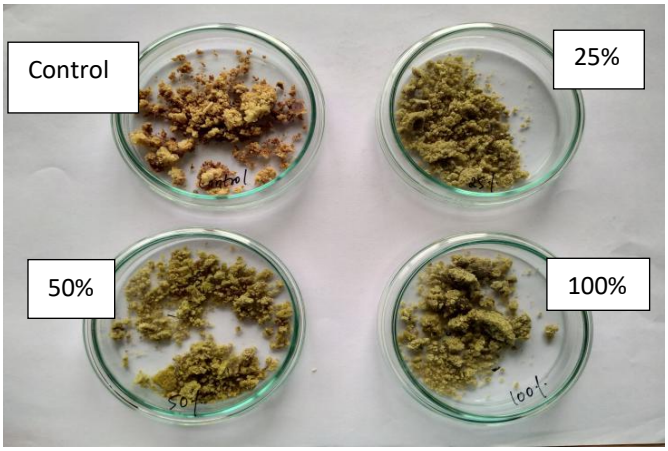

Fig 4.2: Moisture evaporated from the samples

Table 4.4: Percentage of Moisture present in different combinations of bread

Combinations of flours	Weight of wet sample (gm)	Weight of dry sample (gm)	Moisture (%)
100 gm of maida flour (Control)	5	57.68-53.30 =4.38	12.4
25 gm wheat flour + 75 gm maida flour	5	59.85- 55.56 = 4.29	**14.2**
50 gm wheat flour + 50 gm maida flour	5	57.36- 53.09 = 4.27	**14.6**
100 gm of wheat flour	5	58.38-53.98 =4.4	12

Results: The highest percentage of moisture is seen in the Sample containing 50 % composition. The highest moisture content is 14.6 % when compared with other sample.

4.5 Total ash analysis by muffle furnace

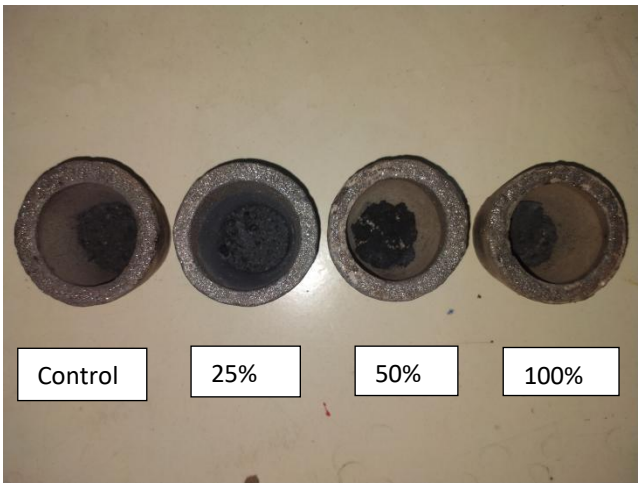

Fig 4.3: The ash content of the bread

Table 4.5 Percentage of Total ash present in different combinations of bread

Combinations of flours	Sample weight (gm)	Ash weight (gm)	Total ash value %
100 gm of maida flour (Control)	4	0.269	6.72
25 gm wheat flour + 75 gm maida flour	4	0.270	6.75
50 gm wheat flour + 50 gm maida flour	4	0.253	**6.32**
100 gm of wheat flour	4	0.273	6.82

Results: The lowest percentage of ash is present in 50 % composition of the sample. The ash percentage is 6.32 % which is lowest when compared with others. The ash content should be less because the inorganic contents in the food is accumulated in the body if ash content is high.

4.6 Sensory analysis of bread

4.6.1 Preference test

The panelist ranked the samples from 4 to 1 which are referred as the most preferred to the least preferred samples.

Table 4.6 Panelist ranked the samples based on their preference

Sl. no	Sample A	Sample B	Sample C	Sample D
1	2	1	3	4
2	1	2	4	3
3	2	1	4	3
4	2	3	4	1
5	3	1	4	2
6	2	3	4	1
7	4	1	3	2
8	3	4	2	1
9	2	3	4	1
10	1	3	2	4

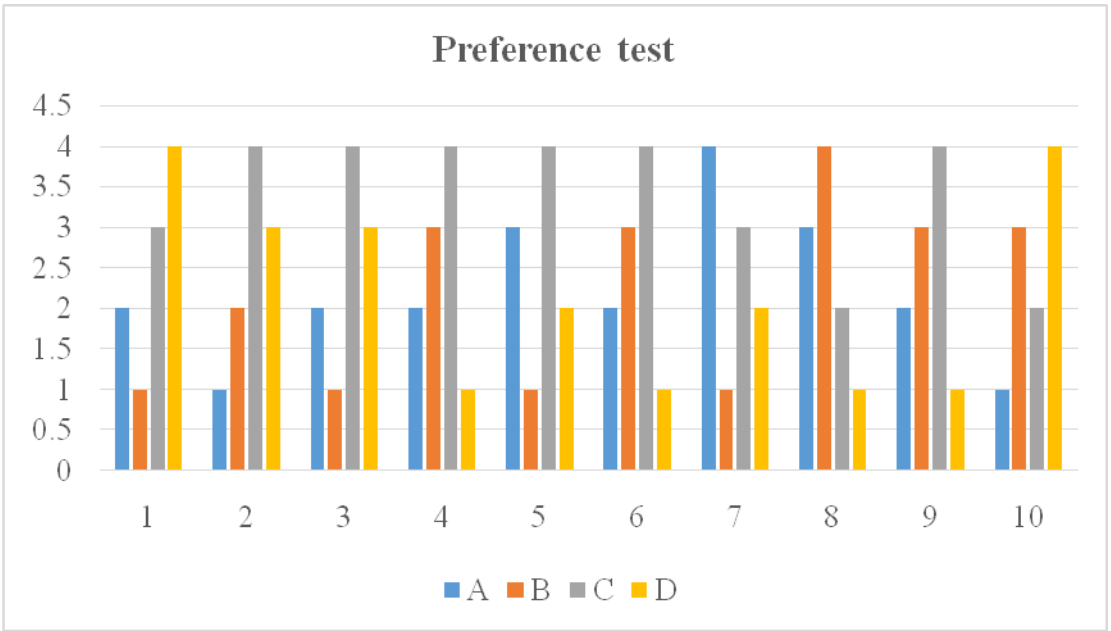

Fig 4.4: Preference test graph

Result: From the above graph plotted, the preference of the panelists about the developed bread is observed. Total number of the panelist were 10, the preference of the panelist changes from one another. From this graph it is concluded that 6 out of 10

member's liked the C coded bread, 1 out of 10 members liked A coded bread, 1 out of 10 liked the B coded bread, 2 out of 10 liked the D coded bread.

From these preferences, C coded sample has 60% acceptance compared with other samples.

4.6.2 Hedonic test

In this test the panelist has given the numbers out of 5 to the attributes of the sample.

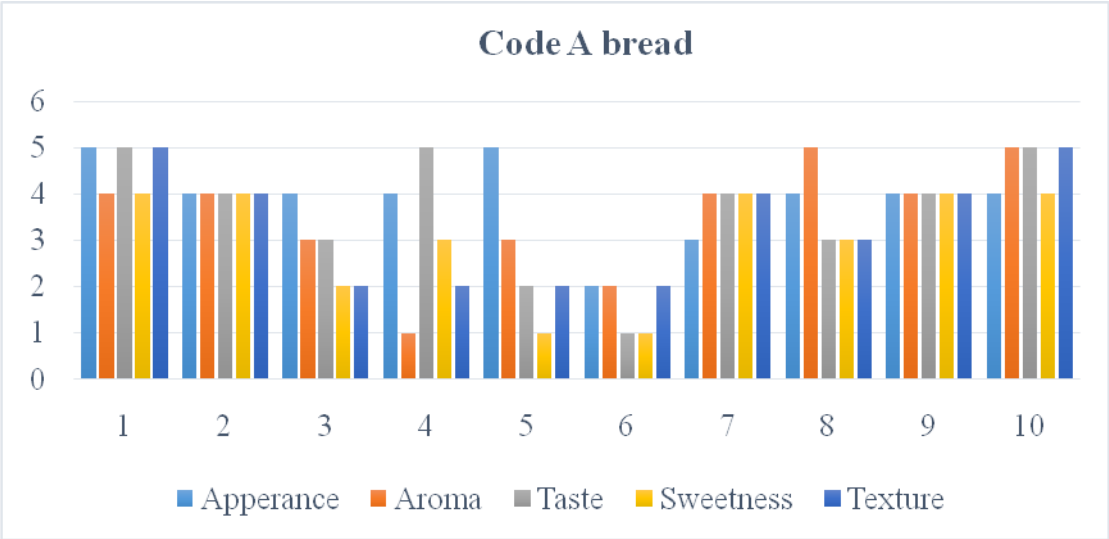

Fig 4.5: Hedonic graph of Code A bread

Table 4.7: Number given by panelists for Attributes of sample A out of 5

Sl.No	Appearance	Aroma	Taste	Sweetness	Texture
1	5	4	5	4	5
2	4	4	4	4	4
3	4	3	3	2	2
4	4	1	5	3	2
5	5	3	2	1	2
6	2	2	1	1	2
7	3	4	4	4	4
8	4	5	3	3	3
9	4	4	4	4	4
10	4	5	5	4	5
Average	**3.9**	**3.5**	**3.6**	**3**	**3.3**

Result: From the above graph of 5 attributes, the average sum of appearance, aroma, taste, sweetness, texture were recorded as 3.9, 3.5, 3.6, 3, 3.3 out of 5 in number. The panelists liked mostly the appearance of this bread

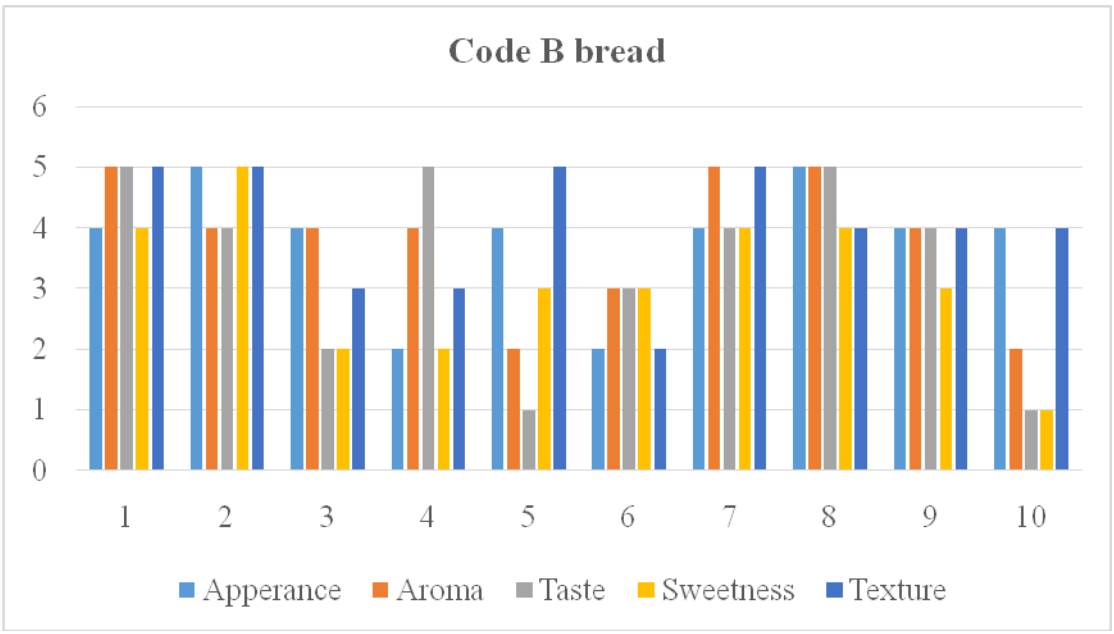

Fig 4.6: Hedonic graph of Code B bread

Table 4.8: Number given by panelists for Attributes of sample B out of 5

Sl. No	Appearance	Aroma	Taste	Sweetness	Texture
1	4	5	5	4	5
2	5	4	4	5	5
3	4	4	2	2	3
4	2	4	5	2	3
5	4	2	1	3	5
6	2	3	3	3	2
7	4	5	4	4	5
8	5	5	5	4	4
9	4	4	4	3	4
10	4	2	1	1	4
Average	**3.8**	**3.8**	**3.4**	**3.1**	**4**

Result:From the above graph of 5 attributes, the average sum of appearance, aroma, taste, sweetness, texture were recorded as 3.8, 3.8, 3.4, 3.1, 4 out of 5 in number. The panelists liked mostly the texture of this bread.

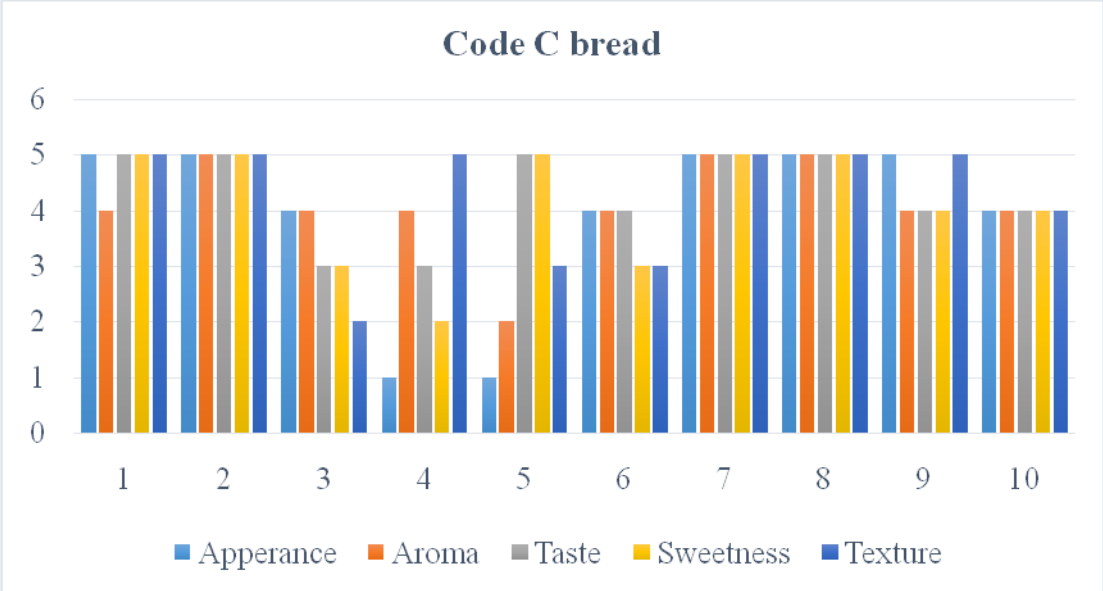

Fig 4.7: Hedonic graph of Code C bread

Table 4.9: Number given by panelists for Attributes of sample C out of 5

Sl. No	Appearance	Aroma	Taste	Sweetness	Texture
1	5	4	5	5	5
2	5	5	5	5	5
3	4	4	3	3	2
4	1	4	3	2	5
5	1	2	5	5	3
6	4	4	4	3	3
7	5	5	5	5	5
8	5	5	5	5	5
9	5	4	4	4	5
10	4	4	4	4	4
Average	**3.9**	**4.1**	**4.3**	**4.1**	**4.2**

Result: From the above graph of 5 attributes, the average sum of appearance, aroma, taste, sweetness, texture were recorded as 3.9, 4.1, 4.3, 4.1, 4.2 out of 5 in number. The panelists liked mostly the taste of this bread.

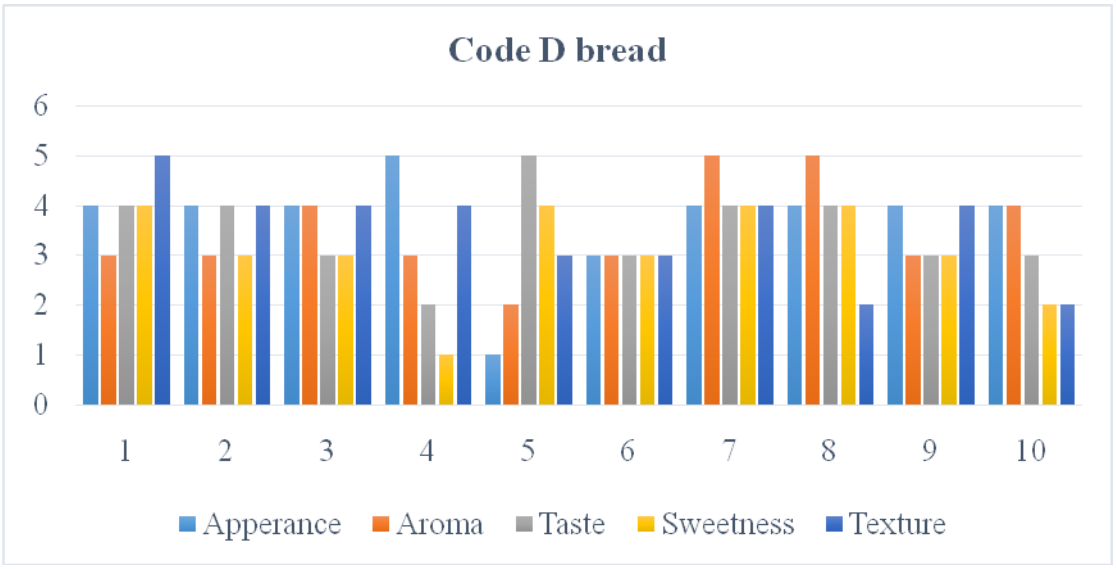

Fig 4.8: Hedonic graph of Code D bread

Table 4.10: Number given by panelists for Attributes of sample D out of 5

Sl. No	Appearance	Aroma	Taste	Sweetness	Texture
1	4	3	4	4	5
2	4	3	4	3	4
3	4	4	3	3	4
4	5	3	2	1	4
5	1	2	5	4	3
6	3	3	3	3	3
7	4	5	4	4	4
8	4	5	4	4	2
9	4	3	3	3	4
10	4	4	3	2	2
Average	**3.7**	**3.5**	**3.5**	**3.1**	**3.5**

Result:From the above graph of 5 attributes, the average sum of appearance, aroma, taste, sweetness, texture were recorded as 3.7, 3.5, 3.5, 3.1, 3.5. out of 5 in number. The panelists liked mostly the aroma, taste and texture of this bread.

DISCUSSION

The main papers referred for this study were Rahman *et al.*, 2015 and SuneethaRunjala*et al.*, 2013, where the wheat grass is incorporated into the muffins and the biscuits and their analysis were carried out.

The four samples of muffins were developed, in which first sample is not incorporated with wheat grass where as the other samples were incorporated with wheat grass in the order of 2.5 gm, 5 gm, 7.5 gm respectively (Rahman *et al.*, 2015).

The biscuits were incorporated with wheat grass with different compositions namely, 20 gm, 30 gm, 40 gm respectively (SuneethaRunjala*et al.,* 2013).

The bread coded with C have the highest carbohydrate content of 69 µl/ml when compared with others compositions. In accordance with the paper (Rahman *et al.*, 2015), the muffins with 5 % wheat grass has the highest percentage of carbohydrates with 3.16 %, when compared with others.

The bread coded with C has shown the highest percentage of protein value of 18.55 % contrast to the other samples. In accordance with the paper (SuneethaRunjala*et al.*, 2013), the biscuits with 40 gms of wheat grass along with cashews has shown the highest protein of 20.6 gm in 100 gm of biscuits.

The C coded bread has the highest fat percentage of 7.5 % when compared with the others, In accordance with the paper (Rahman *et al.*, 2015), The concentration of the fat is high in the sample of Control in muffins. The fat value obtained is 17.60 %.

The bread with C code has shown the highest moisture content of 14.6 % in 50 % of sample and lowest ash content of 6.32% in 50% of the bread sample. In accordance with SuneethaRunjala*et al.,* 2013, the moisture and the ash percentage has shown the highest value of 3.1 gm and 2 gm in the 100 gm of biscuits which consist of 40 gm of wheat grass along with the cashews.

The ash contents should be less because the inorganic matter is not digested in the body hence there is chance of accumulating these matters in the body.

From the sensory analysis results, it is concluded that the taste of the food sample preference is different among the people, but the C coded sample had shown the excellent acceptability among the panelists. The Sample C is accepted by 60 % of the panelists in the preference test. In the hedonic test of the developed bread, all the samples coded with A, B, C and D had one or the other good attributes, but the most acceptable attributes is seen in the sample coded with C where the average value of acceptance is more than 3.9 to 5 out of 5 value.

From overall results analyzed, the bread developed with 50 gm of wheat flour and 50 gm of refined flour with wheat grass powder and Malabar spinach fruit extract has shown the acceptability when compared with other compositions of developed bread.

CHAPTER 5

CONCLUSION

From this study it is concluded that the developed and evaluated bread with different compositions of flour along with wheat grass powder and malabar spinach berry extract had shown the rich source of bio-molecules such as carbohydrates, protein, fat, moisture and total ash content. The product can be used as protein rich bread source for the people who have protein deficiency.

The most acceptable bread was considered as the sample C which is rich with all the nutrients. The sample A bread is consumed in our daily food habits as it is only made with maida flour and it is easily obtained from the market.

The bread made from composition of 25 % (25:75), 50 % (50:50), 100 % wheat flour of the bread can be preferred to be consumed by any age group as it is rich in nutritional quality. The developed product can be easily made in home to reap the benefits of wheat grass and malabar spinach.

FUTURE SCOPE

The wheat grass has different varieties of products in the current market, such as capsules, powder which are environment friendly. According to the market analysis the wheat grass products have a great demand in India and abroad where people are depending on plant based products.

Consumers demand for healthier foods like low carbs, protein rich and more nutrient rich breads. As the demand for the fortification of the bread is increasing in the world. However wheat grass powder and malabar spinach fruit are rich with all the nutrients and plant derived, hence it will be acceptable in the market. The addition of the wheat grass and malabar spinach fruit to the plain bread will increase its demand in future as it contain more nutrition than the normal refined flour bread

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CERTIFICATE

This is to certify that the project entitled "Phytochemical Formulation of Herbal Drink for Diabetes Mellitus"is a work carried out by Miss. Ritu B Nikam bearing USN: 2BA20FBT03,inpartial fulfillment for the award of M.Tech Food Biotechnology, in the Department of Biotechnology, Basaveshwar Engineering College (A), Bagalkote, affiliated to Visvesvaraya Technological University, Belagavi during the academic year 2021-2022. To the best of our knowledge, the work reported in this dissertation has not submitted by the candidate elsewhere for the award of any other degree. It is certified that all corrections, suggestions indicated during internal assessment have been incorporated in the report.

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Guide	Coordinator	HOD	Principal

Examiners

Signature with date

1) Dr. Premjyoti Patil — 19/9/2022

2) Dr. N. RAJESWARI — 19/9/2022

3) Dr. Bharati S. Meti — 19/9/22

CHAPTER 1

INTRODUCTION

Diabetes mellitus is among normal persistent disease across the world and the quantity of diabetic patients is on the ascent.The World Health Organization (WHO) gauges that around 200 million individuals all around the globe are experiencing diabetes and this figure is probably going to be multiplied by 2030 and it is the seventh driving reason for death of human. WHO expresses that around 80% of the deaths happen consistently because of diabetes in many nations [1].Indian council for medical research-India diabetes (ICMR-INDIAB) public review detailed that there are 62.4 million individuals with type 2 diabetes (T2DM) and 77 million individuals with prediabetes in India. This will be expanded to 100 million by 2030 [2, 3].

Type 2 diabetes habitually influences advanced age individuals, along withyoung populace too and there by influencing the nature of work and wellbeing, including more diabetes patients each year[2,4].In scientific journals numerous Indian medicinal plants are being utilized for their great use in diabetes and reports on benefits of utilizing such plants[4].Plant-based drugs as a precious medication were suggested by the World Health Organization (WHO), due to their apparent adequacy, with negligible secondary effects and sensibly low expenses.Medication cannot be the only answer,there is a need for holistic approach for treatment of the disease.Nutraceuticals can be the hope for the wellness of diabetes and prediabetic people.Especially nutraceuticals of plant origin are still better because of less side effects and improvement in the health.

Herbal tea/drinks are rich wellsprings of normal bioactive mixtures like carotenoids, phenolic acids, flavonoids, coumarin, alkaloids, polyacetylenes, saponins and terpenoids. An abundance of accessible logical proof shows that regular bioactive mixtures render various broadened organic impacts, like cell reinforcement, antibacterial, antiviral, antiallergic, antithrombotic and vasodilatory activities, as well as antimutagenicity, anticarcinogenicity and antiaging impacts.Natural drinks, which are consumed as balanced diet, may further develop the cell reinforcement status and improve the general wellbeing status.

Herbal teas are mainly combinations of several ingredients, and are known as 'tisanes.' Tisanes are produced using blends of dried leaves, seeds, grasses, nuts, barks, natural products, blossoms, or other plant components that give them their taste and give the advantages of home grown teas [28].Unlike most different types of tea, natural teas don't contain caffeine. They additionally taste perfect and are palatable. Most natural teas might comprise of one primary herbal ingredient or a

mix of herbal ingredients, expected to achieve a particular reason, like mental relaxation, revival, help from a particular condition, in addition to other things [29].It is likewise critical to comprehend that there are an enormous assortment of home grown teas accessible in the market, which areproposed to have a particular restorative or restorative advantage.Nonetheless, there are a few general advantages of natural teas, some of them are mentioned below:

- Accomplishing a relaxed state of mind
- Supporting heart wellbeing
- Supporting with stomach and stomach related issues
- Giving purging properties to the body
- Advancing energy and wellbeing
- Sustaining the sensory system
- Fortifying the invulnerable framework
- Giving cell reinforcements to the body
- Supporting energy levels and strengthening the body
- Alleviating pressure
- Assisting with keeping away from colds
- Animating the interior organs
- Advancing a decent night's rest
- Caffeine free and tastes extraordinary.

Because of such reasons thephytochemicals have gained attention from the pharmaceutical companies. According to studies, molecular docking has saved time and money through screening of the phytochemicals. Molecular docking is a kind of bioinformatics modeling which includes the connection of at least 2 particles to give a steady protein-ligand complex. To visualize the molecule, three layered construction is an appropriate choice to fit in the desired protein-ligand complex. The three layered construction of the complex is anticipated by relying on the limiting properties of ligand and target. The data acquired from the insilico strategy can be utilized to recommend the limiting energy, free energy and steadiness of complexes.

Phytochemical concentrates spread the word about the presence of a various phytochemicals, for example, lignans, alkaloids, flavonoids, triterpenes, sterols, polyphenols and tannins. These assistus with knowing the wide assortment of pharmacological activities, for example,

antihyperglycemic, antioxidant, antidiabetic action, cancer prevention agent and hypolipidemic. Thesteps for molecular docking are protein preparation, active site prediction and ligand preparation. In first step 3D design of protein preparation is required. The protein which fits in protein ligand complex needs to be docked and usually recovered from PDB bank.

Based on the literature survey, Glucokinase was found to fit in the required complex.Glucokinase is a monomeric cytoplasmic compound found in the liver and pancreas. Its main function is to regulate glucose levels in these organs. During phosphorylation,Glucokinase can build the digestion of glucose. In the liver it builds the union of glycogen and it is the most important phase in glycolysis, the principal maker of ATP in the body. Subsequently, GK would be an ideal medication focus for type 2 diabetes (T2D) illnesses due to its high effect in glucose homeostasis, and its actuation brings about lower blood glucose irrespective of the reason forhyperglycemia. Similarly, docking of flavonoids as insulin receptor Glucokinase, which may cure Diabetes mellitususing Pyrx software, is been reported [8, 11].Further,studies have been taken from insilico to in vivo and invitro to analyze and compare both the studies.

Initiation of exploratory diabetes mellitus in animals on the grounds that in vivostudies (animal models) assumes a viable part in deciding the pathogenesis of the sickness [34,35]. Regardless of various insilico and invitro studies, animal models actually stays effective in grasping the complicated differential-determination and multi-fundamental cooperations associated with diabetes[36].Moreover the current treatment for diabetes contains insulin and an assortment of oral enemy of diabetic specialists like sulfonylureas, Thiazolidinediones, α-Glucosidase inhibitors etc.These drugs are utilized as monotherapies or in mix to achieve improved glycemic control. Subsequently drug revelation/discovery has moved its concentration to normal plant sources making insignificant side impacts. Plants assume a significant part in the revelation of new restorative specialists and definitely stand out as organically dynamic substances including cell reinforcements, hypoglycemic and hypolipidemic specialists. The trial creature utilized in the investigation of diabetes mellitus can be classified into three kinds, for example, hereditarily diabetic creatures, random models and different models to actuate exploratory diabetes mellitus [37].

Diabetes can be created in the exploratory creatures either by unconstrained techniques or by utilizing substance specialists [38]. Animal models might be created by two head components: sickness acceptance (e.g., utilizing explicit medications) or hereditary control. Both are of huge

as they empower the investigation of specific systems connected with the sickness and are significant for grasping the pathogenesis and movement of the illness and extrapolating to people. Since T1DM and T2DM are metabolic problems that reflect complex mix of body frameworks, cautious thought is required in picking the right animal model to be utilized in various in vivo tries [39].

To accomplish this objective, a cautious examination of the particular parts of the illness and the particular information that is designated in each study should be performed while picking a diabetes mellitus animal model [30].Since T1DM is described by the lack of insulin creation, the lack is accomplished in trial creatures through substance annihilation of pancreatic β-cells or through rearing of rodents that precipitously create immune system diabetes. On the other hand, T2DM creature models are more various and may embrace corpulent and non-fat models with variable insulin opposition and β-cell disappointment degrees. As the diabetes is not just a disease but it is syndrome associated leading to the symptoms like polyphagia,polyuria, polydipsia, all leading to renal disorders, loss of vision, loss muscle strength, variation with BP and CVD,Which leads to compromise with quality of life and affecting community health.Subsequently this study was taken up to examine the antihyperglycemic and antihyperlipidemic exercises of the herbal tea in alloxan prompted diabetic mice.Based on these observations, studies are carried through following objectives:

1.1 OBJECTIVES

- To identify antidiabetic phytochemicals studies through Molecular Docking
- To formulate herbal drink for Diabetes mellitus
- To check the efficacy of herbal drink on induced rats

CHAPTER 2

REVIEW OF LITERATURE

Diabetes mellitusis an exceptionally complex metabolic issue which is viewed as one of the quickest developing general medical conditions in the world. It is described by hyperglycemia, a condition with high glucose level in the blood plasma because of imperfections in insulin emission or its activity.

2.1 Molecular Docking

The key role of Computational Biology and Bioinformatics has become particularly significant these days.The screening of restorative plants to find their viability to an illness is finished through in Silico approach.Analysis of the bioactive mixtures using quercetinthat have been effectively recognized through sub-atomic docking.This has been done by utilizing a few mixtures like Quercetin, against endogenous targets, for example, Glycogen phosphorylase, Peroxisome Proliferator-enacted Receptor (PPAR)-y, Glucokinase, Protein Tyrosine Phosphatase 1-beta (PTP-1B), GLUT4, and so on.

In Silico approaches like Protein Database (PDB), GenBank and programming projects, for example, Autodock and modeler are vital to these examinations has been reviewed in [7].The antiglycaemic potential was surveyed in vitro by concentrating on the inhibitory activities of the concentrates with α-amylase, α-glucosidase and sucrase.The antiglycaemic properties of the methanolic concentrates of the dried leaf of *Cassia alata L*. through in vitro and in Silico approaches. Recently recognized compounds (emodin, quercetin, chrysoeriol, and kaempferol) were docked with α-amylase (1HNY), α-glucosidase (5ZCB), and sucrase-isomaltase (3LPO) utilizing the Pyrx Virtual Screening instrument [8].

Pharmacophore demonstrating and iota based 3-QSAR of 116 dynamic mixtures against lysosomal α-glucosidase were performed and identified the positions to get appropriate binding energy. A sum of 116 coumarin subsidiaries with IC50 values against lysosomal α-glucosidase was chosen for a CADD (PC helped drug configuration) and to recognize more intense medications.In sub-atomic docking of 116 coumarin subsidiaries against the lysosomal α-

glucosidase protein and three mixtures (isorutarine, 10_, and 36) brought about a docking score of −7.64, −7.12 and −6.86 kcal/mol were obtained in current review [9].

The bioactivity of the α-caesalpin compound from *Caesalpinia crista* for antidiabetic in view of molecular docking studies.The water particle and ligands were taken out by utilizing PyMOL v1.7.4.5 Software (Schrödinger). Atomic docking tests were performed utilizing the PyRx 0.8 programming. Expectation and critical descriptors of Physicochemical Properties, Lipophilicity, Pharmacokinetics and Drug likeness properties of the mixtures were anticipated utilizing swissadme.The limiting partiality of α-caesalpin with NOS_3 protein is - 7.9, while restricting liking NOS_3 with the control compound β-estradiol is - 10.1. Drug likeness expectation showed that α-caesalpin satisfy the principles of Lipinski, Ghose, Veber, Egan and Muegge with 0.55 Bioavailability Score [11].

The insilico plan and sub-atomic docking investigations of benzimidazolebearingthiazolidin-4-one subsidiaries as PPARγ agonists in diabetes mellitus. In silico plan of proposed subsidiaries were directed by ACD lab Chemsketch 12.0 and subordinates submitting to Lipinski's standard of five were chosen for sub-atomic docking concentrates via Autodock Vina was been reviewed in [12].

Table 2.1: List of phytochemicals subjected for Docking Studies

Sl. No	CompoundName	Molecular Formula	Pubchem Id	REFERENCES
1.	Aegeline	$C_{18}H_{19}NO_3$	15558419	[7]
2.	Gallic acid	$C_7H_6O_5$	370	
3.	Mangiferin	$C_{19}H_{18}O_{11}$	5281647	
4.	Quercetin	$C_{15}H_{10}O_7$	5280343	
5.	Emodin	$C_{15}H_{10}O_5$	3220	[8]
6.	Quercetin	$C_{15}H_{10}O_7$	5280343	
7.	Chrysoeriol	$C_{16}H_{12}O_6$	5280666	
8.	Kaempferol	$C_{15}H_{10}O_6$	5280863	
9.	Isorutarine	NA		[9]
10.	10_	$C_{16}H_{20}N_2O_4$	588239	
11.	36	-	-	

12.	Bergenin	$C_{14}H_{16}O_9$	66065	[10]
13.	Beta-Sitosterol	$C_{29}H_{50}O$	222284	
14.	Betulinic acid	$C_{30}H_{48}O_3$	64971	
15.	Citric acid	$C_6H_8O_7$	311	
16.	Petunidin 3-gentiobioside	$C_{28}H_{33}O_{17}^+$	44256956	
17.	Kaempferol	$C_{15}H_{10}O_6$	5280863	
18.	Quercetin	$C_{15}H_{10}O_7$	5280343	
19.	Epifriedelanol	$C_{30}H_{52}O$	119242	
20.	Friedelin	$C_{30}H_{50}O$	91472	
21.	Clausenaline E	$C_{14}H_{11}NO_2$	86106588	[13]
22.	Clausenaline C	$C_{19}H_{19}NO_4$	101879360	
23.	Murrayanine	$C_{14}H_{11}NO_2$	96942	
24.	vanillic acid	$C_8H_8O_4$	8468	
25.	Xanthotoxol	$C_{11}H_6O_4$	65090	
26.	Maackiain	$C_{16}H_{12}O_5$	91510	[14]
27.	Variabilin	$C_{25}H_{34}O_4$	54678431	
28.	Formononetin	$C_{16}H_{12}O_4$	5280378	
29.	Diethyl Nitrosamine	$C_4H_{10}N_2O$	5921	[15]
30.	2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one	$C_6H_8O_4$	119838	
31.	4-methylcatechol	$C_7H_8O_2$	9958	
32.	2,4-di-tert-butylphenol	$C_{14}H_{22}O$	7311	
33.	diethyl phthalate	$C_{12}H_{14}O_4$	6781	
34.	Gossypetin	$C_{15}H_{10}O_8$	5280647	[17]
35.	Herbacetin	$C_{15}H_{10}O_7$	5280544	
36.	Kaempferol	$C_{15}H_{10}O_6$	5280863	
37.	Leucoperalgonidin	NA		
38.	Leucodelphinidin	$C_{15}H_{14}O_8$	3081374	
39.	Sorbifolin	$C_{16}H_{12}O_6$	3084390	
40.	Gymnemic Acid	$C_{36}H_{58}O_{11}$	91617592	[19]
41.	Trigonelline	$C_7H_7NO_2$	5570	

42.	Ferulic Acid	$C_{10}H_{10}O_4$	445858	
43.	Hesperidin	$C_{28}H_{34}O_{15}$	10621	[20]
44.	Naringin	$C_{27}H_{32}O_{14}$	442428	
45.	Neohesperidin	$C_{28}H_{34}O_{15}$	442439	
46.	Nobiletin	$C_{21}H_{22}O_8$	72344	
47.	Rutin	$C_{27}H_{30}O_{16}$	5280805	[21]
48.	Gossypol	$C_{30}H_{30}O_8$	3503	
49.	Alpha-methyl Cinnamic Acid	$C_{10}H_{10}O_2$	14541	[22]
50.	4-Fluoro Cinnamic Acid	$C_9H_7FO_2$	98070	
51.	p-Methoxy Cinnamic Acid	$C_{10}H_{10}O_3$	13245	
52.	Octyl Methoxy Cinnamate	$C_{18}H_{26}O_3$	11044481	
53.	p-Hydroxy Cinnamic Acid	$C_9H_8O_3$	322	
54.	Butein	$C_{15}H_{12}O_5$	5281222	[23]
55.	Herbacetin	$C_{15}H_{10}O_7$	5280544	
56.	Leucopelargonidin	$C_{15}H_{14}O_6$	3286789	
57.	Nimbidinin	$C_{26}H_{34}O_6$	169088	
58.	Coumarin	$C_9H_6O_2$	323	
59.	Tolbutamide	$C_{12}H_{18}N_2O_3S$	5505	
60.	Metformin	$C_4H_{11}N_5$	4091	[24]
61.	Quercetin	$C_{15}H_{10}O_7$	5280343	
62.	Pimaric acid	$C_{20}H_{30}O_2$	220338	[25]
63.	Catechin	$C_{15}H_{14}O_6$	9064	
64.	Abietic acid	$C_{20}H_{30}O_2$	10569	
65.	Taxifolin	$C_{15}H_{12}O_7$	439533	
66.	Sandracopimaric acid	$C_{20}H_{30}O_2$	221580	
67.	Dehydroabietic acid	$C_{20}H_{28}O_2$	94391	
68.	Pinoresinol	$C_{20}H_{22}O_6$	73399	
69.	Neoabietic acid	$C_{20}H_{30}O_2$	221118	
70.	Cedeodarin	$C_{16}H_{14}O_7$	182026	
71.	Stigmasterol	$C_{29}H_{48}O$	5280794	

72.	Campesterol	$C_{28}H_{48}O$	173183	
73.	Sitosterol	$C_{29}H_{50}O$	222284	
74.	Friedelin	$C_{30}H_{50}O$	91472	
75.	Pinosylvin	$C_{14}H_{12}O_2$	5280457	
76.	Rhamnetin	$C_{16}H_{12}O_7$	5281691	
77.	Xanthone	$C_{13}H_8O_2$	7020	
78.	Cyclohexene, 3-(1,5-dimethyl-4-hexenyl)-6-methylene	$C_{15}H_{24}$	519764	[26]
79.	Phytol	$C_{20}H_{40}O$	5280435	
80.	Thymol	$C_{10}H_{14}O$	6989	
81.	Falcarinol	$C_{17}H_{24}O$	5281149	

2.2 Herbal Tea

Herbal tea is basically a natural blend produced using leaves, seeds or potentially underlying foundations of different plants. Herbal teas are mainly combinations of several ingredients, and are known as 'tisanes.' There are a few types of tisanes that have been utilized for their restorative properties. Some of them being consumed for its stimulating properties to assist with mental relaxatation, to control stomach or stomach related issues and reinforce the insusceptible framework. Some of the famous natural teas are Green tea, Star anise tea, Ginger tea, Tulsi tea, Cinnamon tea, Turmeric tea, Lemon grass tea, Cardamom tea, Stevia tea. These teas have major areas of strength for each advantages, for example, Green tea is a ‘non-matured’ tea, and contains more catechins, than dark tea or oolong tea. Catechins are in vitro and in vivo solid cell reinforcements [27].

The dried corn silk powder assortment of VL Baby corn-1 for detailing of seasoned herbal tea with various mix of Clove, Tulsi,Thyme, Cinnamon powder, Timur, Gandraini, Lemon grass and with one just corn silk with practically no different spices and to know cell reinforcement properties of formulated tea. Consequence of tangible assessment try showed that all blends were loved reasonably[28].To perform healthful, Phytochemical and tactile examination and surveying the capability of herbal tea comprised of *Wedeliachinensis* leaves and *Boerhaaviadiffusa*roots establishes in having Phytochemical contents and to be a piece of natural tea improvement.

The Phytochemical investigation were performed for every spice test to decide the absolute phenolics, complete flavanoids, rough alkaloids, tannins and ID of phytoconstituents, for example, phytosterol, coumarin, terpenoids, anthraquinone and phlobatannins.The consequences of the dietary, phytochemical showed that the combination of spices *Wedeliachinensis*leaves and *Boerhaaviadiffusa* roots are good constituents of nutraceuticals with high restorative significance. Theuseful phytochemicals highlighted in this polyherbal detailing, makes it as an ideal physical and mental wellbeing rejuvenator [29].These teas have areas of strength for eachadvantage, for example, Astragalus tea, a Chinese local spice that is utilized for its calming and hostile to bacterial properties. Exhibiting not many negative marks, scientists proceed to glance at and vouch for the medical advantages of drinking herbalteas[30].

Table2.2: List of Herbal drinks and it's uses

Sl.No	Herbal Tea/Drink	Importance
1.	Herbal Tea(HT)	This tea is made with leaves, blossoms, and delicate stems of plants. It is a light joining both sporting and therapeutic purposes.
2.	Herbal Infusion(HI)	A bigger measure of spice was bubbled to set up this infusion.This implantation is totally utilized for restorative reason and to furnish body with high portion of nutrients and minerals. Implantation is utilized to extricate nutrients and unpredictable fixings from the leaves and blossoms.
3.	Herbal Decoction(HD)	These are made with barks, roots, seeds, rhizomes, and woods and proposed to extricate mineral salts and unpleasant standards from plants. In contrast to different implantations, these are left on the intensity and stewed for a timeframe.
4.	Herbal Fruit Juice(HFJ)	These are made with fruits.

Table 2.3:Herbalbeverages consumed in thetreatment of diabetes.

Scientific name	Family	Common name	Plant part	Health benefits	References
Aegle marmelos	Rutaceae	Beli,bael, bengal quince	Dried leaves, buds, flowers, immature fruits, bark	antidiabetic, anti inflammatory,Anticancer, antidyslipidaemia,anti hyperglycemic,	[30]
Coriandrum sativum	Apiaceae	Corriandum	Dried fruits	Antioxidant, antibacterial, hypocholesterolemic, anticancer, anti inflammatory	
Aerva lanata	Amaranthaceae	Polpala	Dried whole plant	Antihyperglycemic, anti-inflammatory	
Hemidesmus indicus	Asclepiada-ceae	Indian Sarasaparilla, Iramusu	Dried whole plant	Antioxidant, antithrobotic, antiplatelet aggregation	
Centella asiatica	Apiaceae	Pegaga, Indian pennywort, Gotukola	Dried whole plant	Anticancer, increase the activity of antioxidant enzymes	

Matricaria chamomillaChamaemelum nobile	Compositae	Chamomile	Dried flowers	Antioxidant, hypocholesterolemic, anticancer, anti inflammatory	
Tinospora cordifolia	Menispermaceae	Heart leaved mooseed	Stem, roots	Antidiabetic, anti-inflammatory	
Cassia auriculata	Leguminosae	Tanner's Cassia, Avartaki, Ranawara	Dried leaves, flowers	Antihyperglycemic	
Zingiber officinale		Ginger	Rhizome	Anti Inflammatory, hypoglycemic	

2.3 Clinical Studies on Herbal Tea

Diabetes mellitus and its intricacy are an overall medical issue. Many plants have been utilized to further develop glucose resilience and insulin awareness in treatment systems of diabetes mellitus. Thus, animal models play a basic impact in investigating and depicting illness pathophysiology and prominent verification of targets and reviewing new healing methods using in vivo studies. The literature survey says thatthe remedial impacts of natural tea from *Balanites aegyptiaca* organic products on specific biochemical markers in streptozotocin prompted diabetes mellitus in rodents. Diabetes was prompted in rodents by single intraperitoneal infusion of streptozotocin (STZ) with centralization of 60 mg/kg body weight. Herbal tea arrangements of *B. aegyptiaca* organic products with various treatments 0.25, 0.5, and 1.0% were given to diabetic rodents in substitution of drinking water. Diabetic control and normal groups were given drinking water without natural tea.

The impacts of *B.aegyptiaca* tea on blood glucose, cholesterol, lipid, protein, urea, creatinine and the exercises of liver marker compounds aspartate aminotransferase (AST), alanine

aminotransferase (ALT), and cell reinforcement's markers were analyzed in the plasma of control and treated rodents.Thus, the utilization of *B. aegyptiaca* natural product tea is appropriate to move toward wellbeing advancing [34].

The available medications for diabetes, Insulin or Oral hypoglycemic specialists have at least one side impacts. Searching for new antidiabetic drugs with negligible or no incidental effect from restorative plants isresearch as per WHO proposals. In this perspective, attempted to assess the antihyperglycemic and antihyperlipidemic impacts of *Piper longum* root watery concentrate in streptozotocin (STZ) actuated diabetic rodents. During the transient review the fluid concentrate at a dose of 200 mg/kg body weight was found to have critical antidiabetic movement after 6 h of the treatment.Subsequently this plant might be viewed as one of the expected origin for the segregation of new oral enemy of hypoglycemic agent(s) [35].

According to conventional cases, root, bark, leaf and bloom of the plant *Cassia occidentalis Linn* (Caesalpiniaceae) have been accounted to have antidiabetic action. The study was to assess the antidiabetic movement of ethanolic concentrate of *C. occidentalis* in typical and alloxan prompted diabetic rodents. Ethanolic concentrate of the entire plant of *C. occidentalis* was orally tried at portions of 100 and 200 mg/kg for assessing the hypoglycemic impact in ordinary and alloxan-actuated diabetic rodents. Furthermore, changes in body weight, serum cholesterol, fatty substance and complete protein levels, surveyed in the ethanol extricate treated diabetic rodents were contrasted and diabetic control and normal groups.Ethanolic concentrate of *C. occidentalis* delivered a significant decrease in fasting blood glucose levels in the ordinary and alloxan-prompted diabetic rodents at dosages of 100 and 200 mg/kg body weight. Treatment with ethanolic concentrate of *C. occidentalis* in ordinary and alloxan-prompted diabetic rodents prompted a portion subordinate fall in glucose levels. Ethanolic concentrate of *C. occidentalis* showed significant antidiabetic action in typical and alloxan-actuated diabetic rodents. The rodents additionally showed improvement in boundaries like body weight and lipid profiles and furthermore, histopathologic studies showed recovery of β-cells of pancreas thus it very well may be of worth in the treatment of diabetes [36].

Ficus bengalensis Linn, generally known as the banyan tree, has a place with the Moraceae family. Its bark is utilized for the treatment of diabetes. In the current review, the ethanolic concentrates of the different flying pieces of *Ficus bengalensis Linn* were relatively assessed for

lowering their blood glucose. Histopathology of the treated animal was done to assess the betacytotropic action of different pieces of *Ficus bengalensis*.The ethanolic concentrate of the natural product, on a measurement of 120 mg/kg weight of body, was found to apply a more articulated antidiabetic movement than the ethanolic concentrate of the root or bark. The examination additionally affirmed the antidiabetic activity of the standard medication Glibenclamidewhich was used in the treatment of diabetes [37].

Table 2.4: Therapeutics induced in treatment of Diabetes

Animal	Therapeutics	Doses	Routes	Duration	References
Wistar Rat	Alloxan	120mg/kg	Intraperitoneally	21 days	[36]
Evan's female rat	Alloxan	150mg/kg	Intraperitoneally	4 days	[34]
Wistar Rat	Alloxan	120mg/kg	Intraperitoneally	20 days	[35]
Wistar Rat	Alloxan	150mg/kg	Intraperitoneally	10 days	[37]
Wistar Rat	Alloxan	65 mg/kg	Intravenous	6 days	[38]
Wistar Rat	Streptozotocin	40 mg/kg	Intraperitoneally	35 days	[39]
Wistar Rat	Alloxan	120mg/kg	Intraperitoneally	20 days	[40]
Albino Rat	Alloxan	180mg/kg	Intravenous	50 days	[41]
Wistar Rat	Streptozotocin	50 mg/kg	Intraperitoneally	15 days	[42]
Albino Mice	Alloxan	70mg/kg	Intravenous	14 days	[43]
Albino Rat	Streptozotocin	40 mg/kg	Intraperitoneally	42 days	[44]

Chapter 3

MATERIALS AND METHODS

3.1 Molecular Docking

3.1.1Preparation of Protein:

The Three-layered (3D) construction of the Glucokinase (GK, PDB ID: 1V4S) was recovered from protein data bank in PDB format.The 3D design of protein was pictured in Discovery Studio and water particles present in the protein were deleted.The nature of that protein is great as it had 1.5 A° and succession length in excess of 100 amino acids.

Fig 3.1: 3D design of1V4S

3.1.2 Prediction of Active site:

Followed by the evacuation of water the ligand was chosen to decide the limiting locales/sites in Discovery studio. The dynamic destinations anticipated were Serine151, Phenylalanine152, Proline153, Threonine168, Lysine169, Aspargine204, Aspartate205, Isoleucine225, Glycine229, Cysteine230, Aspargine231, Glutamine287 and Glutamic acid290.

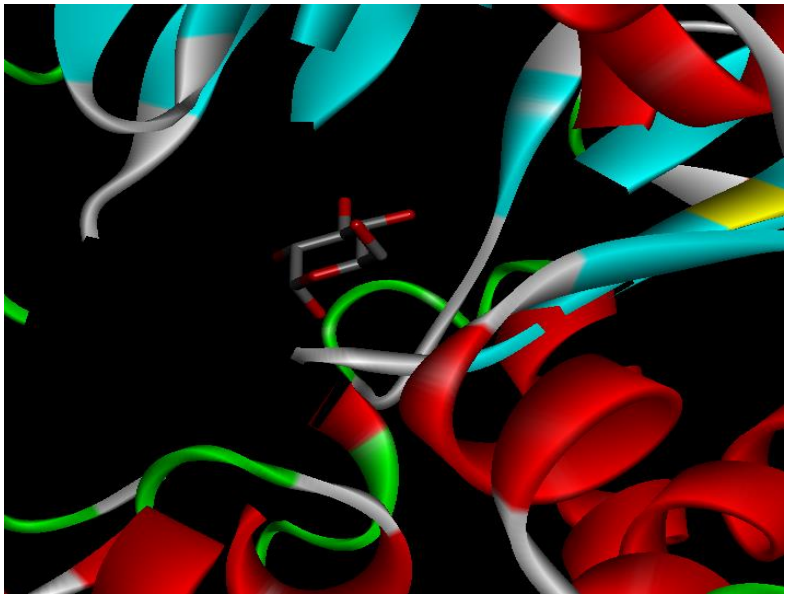

Fig 3.2: Visualization of ligand in protein

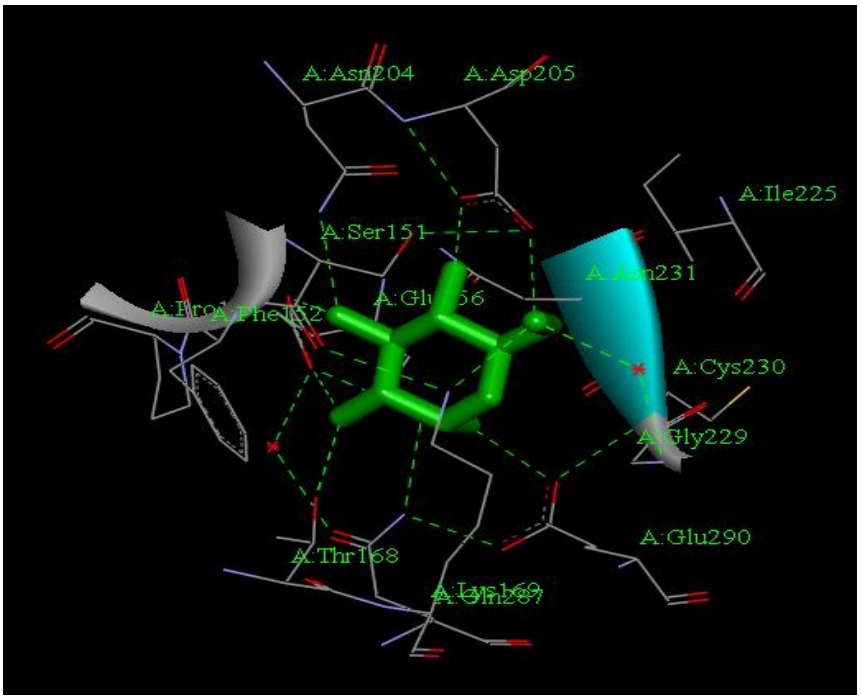

Fig 3.3: Represents the Active site amino acid

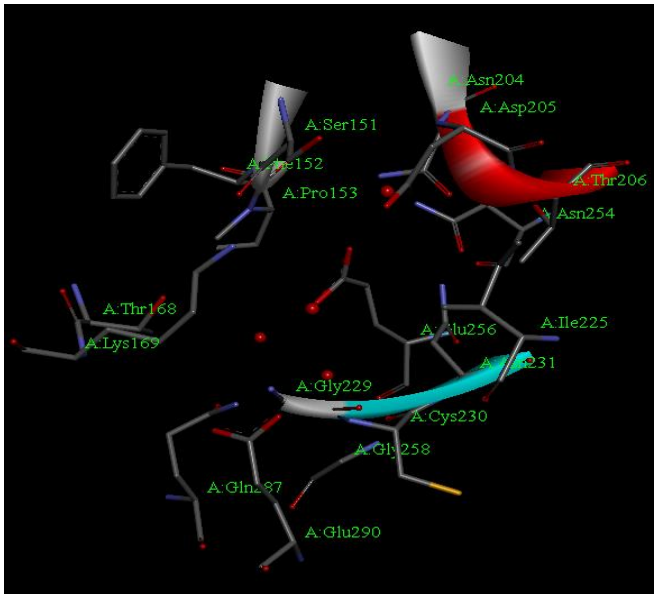

Fig 3.4: Represents the Active site amino acid

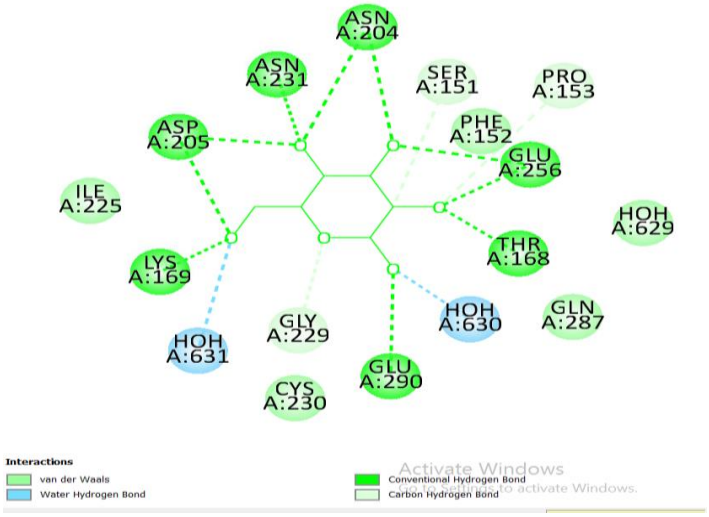

Fig 3.5: Represents the 2D representation of ligand

3.1.3Preparation of ligand:

PubChem is an Open Chemistry Database at the National Institutes of Health (NIH). The three layered designs of Phytochemicals were accessible at PubChem in SDF design. The record transformation from SDF to PDB becomes important as the docking programming requests it. The change of record designs was completed utilizing SMILES online converter to switch SDF over completely to PDB document design.

3.1.4 Flow Chart for Molecular Docking

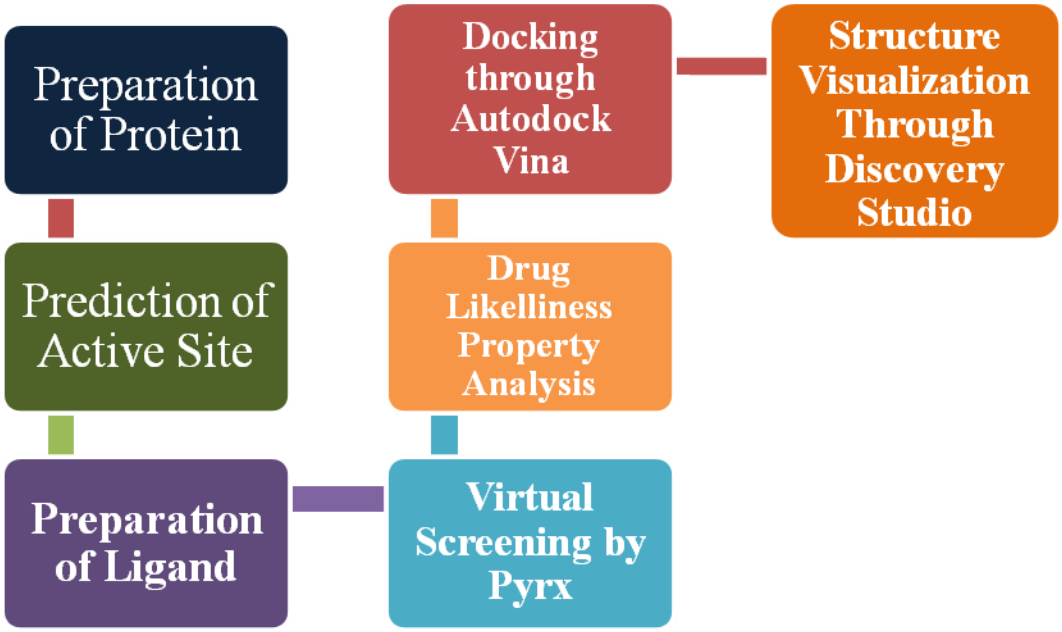

Fig 3.6: Flowchart for molecular docking.

3.1.5Ligand Screening and Drug-likeliness Prediction:

The screening and medication likeliness was done by utilizing Lipinski's standard and ADMET properties.

- **Lipinski's rule :**
  The Lipinski's rule and its reasoning is listed below :

1. Molecular mass should be under 500 Dalton to permit the skin ingestion.
2. High Lipophilicity (LogP) should be under 5 on the grounds that the medication should infiltrate the lipid bilayer of most cell films that of enterocytes.
3. Less than 5 Hydrogen bond givers.
4. Less than 10 Hydrogen bond acceptors.
5. Molar refractivity ought to in the middle between 40-130.

   This rule helps in screening of number of ligands and makes crafted by the analysts and researchers.DruLito (Drug Likeness Tool) is a virtual screening apparatus. Its computation depends on different principles like Lipinski's standard, MDDR-like instrument, Veber rule, Ghose rule, BBB rule, CMC 50 like rule and quantitative Estimate of Chemistry Development kit(CDK), a Java library for descriptor computation.

DruLiTo was utilized by AftabAlam et al. The mixtures which can abuse more than one rule might have issues of bioavailability.

- **Blood Brain Barrier :**

The key role of BBB is to control the material, supplements and cell move blood to the cerebrum as well as the other way around. BBB additionally is known to clean the poisons of the mind to blood. In the treatment of Brain problems the medication should have to cross the Blood Brain Barrier. The greatest test to medicate conveyance into the CNS is bypassing the blood-cerebrum obstruction (BBB) as it limits admittance to the CNS. The BBB has forestalled the utilization of numerous helpful specialists for treating mind related infections and wounds, including AD, stroke, cerebrum cancer, head injury, and other CNS problems throughout the course of recent many years. Ayurveda depends on a few novel strategies for directing spices or their arrangements (or both) to treat CNS issues. Notwithstanding, appropriate examinations are missing to determine if these spices or their parts given orally or by a few different means cross the BBB and arrive at the CNS. In this manner BBB assumes an exceptionally critical part in Drug Discovery.

Table3.1: Name, Molecular formula, PubChem ID, Structure of the phytochemicals involved in our present study.

Sl No.	Ligand	Molecular Weight (g/mol)	logP	H-Bond Acceptors	H-Bond Donors	TPSA	nAtom	nViolation
1.	Aegeline	297.35	2.54	3	2	58.56	22	0
2.	Gallic acid	170.12	0.21	5	4	97.99	12	0
3.	Mangiferin	42.34	0.89	11	8	201.28	30	2
4.	Quercetin	302.24	1.63	7	5	131.36	22	0
5.	Emodin							
6.	Quercetin	302.24	1.63	7	5	131.36	22	0
7.	Chrysoeriol	300.26	2.44	6	3	100.13	22	0
8.	Kaempferol	286.24	1.70	6	4	111.13	21	0
9.	Isorutarine	-	-	-	-	-	-	-
10.	10_	304.34	2.05	4	2	104.64	22	0

11.	36	176.17	0.24	5	3	94.83	12	0
12.	Bergenin	328.27	1.13	9	5	145.91	23	0
13.	Beta-sitosterol	414.71	5.05	1	1	20.23	30	1
14.	Betulinic acid	456.70	3.83	3	2	57.53	33	1
15.	Citric acid	192.12	-1.49	7	4	132.13	13	0
16.	Petunidin 3-gentiobioside							
17.	kaempferol	286.24	1.70	6	4	111.13	21	0
18.	Quercetin	302.24	1.63	7	5	131.36	22	0
19.	Epifriedelanol	428.73	4.84	1	1	20.23	31	1
20.	Friedelin	426.72	4.49	1	0	17.07	31	1
21.	Clausenaline E	225.24	1.91	2	1	42.09	17	0
22.	Clausenaline C	325.36	2.51	4	3	82.55	24	0
23.	Murrayanine	225.24	2.02	2	1	42.09	17	0
24.	vanillic acid	168.15	1.40	4	2	66.76	12	0
25.	Xanthotoxol	202.16	1.69	4	1	63.58	15	0
26.	Maackiain	284.26	2.48	5	1	57.15	21	0
27.	Variabilin	-	-	-				
28.	Formononetin	268.26	2.49	4	1	59.57	20	0
29.	diethyl nitrosamine	102.14	1.99	2	0	32.67	7	0
30.	2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one	144.13	1.19	4	2	66.76	10	0
31.	4-methylcatechol	124.14	1.39	2	2	40.46	9	0
32.	2,4-di-tert-butylphenol	206.32	3.08	1	1	20.23	15	0
33.	diethyl phthalate	222.24	2.26	4	0	58.61	16	0
34.	Gossypetin	318.24	1.33	8	6	151.59	23	1
35.	Herbacetin	302.24	1.50		5	131.36	22	0

36.	Kaempferol	286.24	1.70	6	4	111.13	21	0
37.	Leucoperalgonidin	-	-	-	-	-	-	-
38.	Leucodelphinidin	322.27	1.29	8		150.84	23	1
39.	Sorbifolin	300.26	2.18	6	3	100.13	22	0
40.	Gymnemic Acid	666.84	2.81	11	8	197.37	47	3
41.	Trigonelline	137.14	-3.11	2	0	44.01	10	0
42.	Ferulic Acid	194.18	1.62	4	2	66.76	14	0
43.	Hesperidin	-	-	-	-	-	-	-
44.	Naringin	580.53	1.96	14	8	225.06	41	3
45.	Neohesperidin	610.56	1.42	15	8	234.29	43	3
46.	Nobiletin	402.39	3.96	8	0	85.59	29	0
47.	Rutin	610.52	0.46	16	10	269.43	43	3
48.	Gossypol	518.55	3.36	8	6	155.52	38	2
49.	Alpha-methyl Cinnamic Acid	162.19	1.73	2	1	37.30	12	0
50.	4-Fluoro Cinnamic Acid	166.15	1.65	3	1	37.30	12	0
51.	P-Methoxy Cinnamic Acid	178.18	1.68	3	1	46.53	13	0
52.	Octyl Methoxy Cinnamate	290.40	4.17	3	0	35.53	21	0
53.	P-Hydroxy Cinnamic Acid	164.16	0.95	3	2	57.53	12	0
54.	Butein	272.25	1.66	5	4	97.99	20	0
55.	Herbacetin	302.24	1.50		5	131.36	22	0
56.	Leucopelargonidin	-	-	-	-	-	-	-
57.	Nimbidinin	442.54	2.69	6	3	100.13	32	0
58.	Coumarin	146.14	1.75	2	0	30.21	11	0
59.	Tolbutamide	270.35	1.54	3	2	83.65	18	0

60.	Metformin	129.16	0.34	2	3	91.49	9	0
61.	Quercetin	302.24	1.63	7	5	131.36	22	0
62.	Pimaric acid	302.45	3.07	2	1	37.30	22	1
63.	Catechin	290.27	1.33	6	5	110.38	21	0
64.	Abietic acid	302.45	3.05	2	1	37.30	22	1
65.	Taxifolin	304.25	50.17	7	5	127.45	22	0
66.	Sandracopimaric acid	302.45	3.04	2	1	37.30	22	1
67.	Dehydroabietic acid	300.45	2.76	2	1	37.30	22	1
68.	Pinoresinol	358.39	2.67	6	2	77.38	26	0
69.	Neoabietic acid	302.45	3.15	2	1	37.30	22	1
70.	Cedeodarin	318.28	1.81	7	5	127.45	23	0
71.	Stigmasterol	412.69	5.08	1	1	20.23	30	1
72.	Campesterol	400.68	4.97	1	1	20.23	29	1
73.	Sitosterol	414.71	5.05	1	1	20.23	30	1
74.	Friedelin	426.72	4.49	1	0	17.07	31	0
75.	Pinosylvin	212.24	2.05	2	2	40.46	16	0
76.	Rhamnetin	316.26	2.23	7	4	120.36	23	0
77.	Xanthone	196.20	2.28	2	0	30.21	15	0
78.	Cyclohexene, 3-(1,5-dimethyl-4-hexenyl)-6-methylene	204.35	3.58	0	0	0.00	15	1
79.	Phytol	296.53	4.85	1	1	20.23	21	1
80.	Thymol	150.22	2.32	1	1	20.23	11	0
81.	Falcarinol	244.37	4.10	1	1	20.23	18	1

3.1.6Molecular Docking Studies:

The Molecular docking of 18 ligands with 1V4S protein was conveyed by utilizing PyRx, a virtual screening tool. The dynamic locales were distinguished by utilizing discovery studio. Most docking devices have choice of setting up a grid box around the dynamic site of the objective protein. The grid box has its own importance wherein it permits the ligand to cooperate with the dynamic site of the protein instead of whole protein structure. In this manner the ligand can cooperate just with the dynamic site of amino acid which deposits and give the limiting affinity.A grid box was set at the dynamic destinations then phytochemical was brought into the protein-ligand complex. The limiting energies of phytochemicals with 1V4S were noted down.

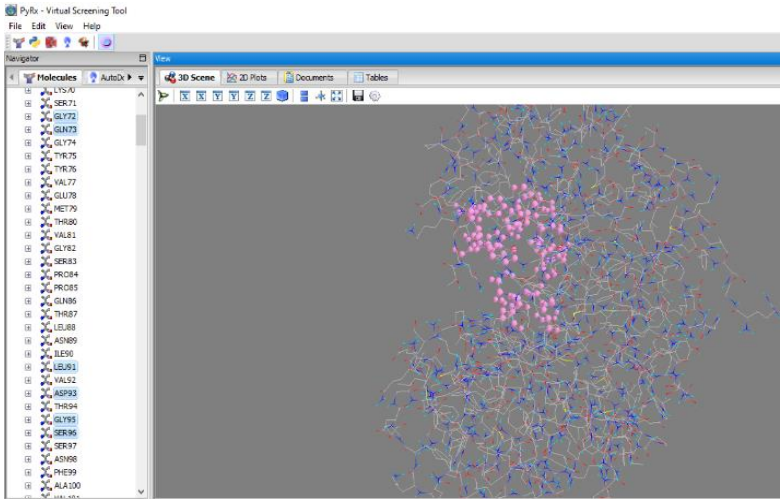

Fig 3.7: Active Site residues are marked out.

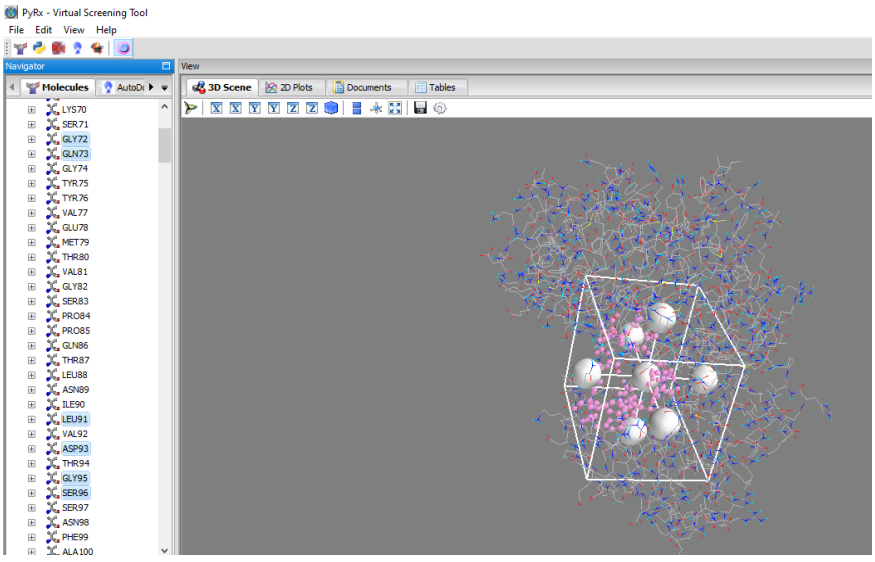

Fig 3.8: A grid box is set over the Active Site amino acids

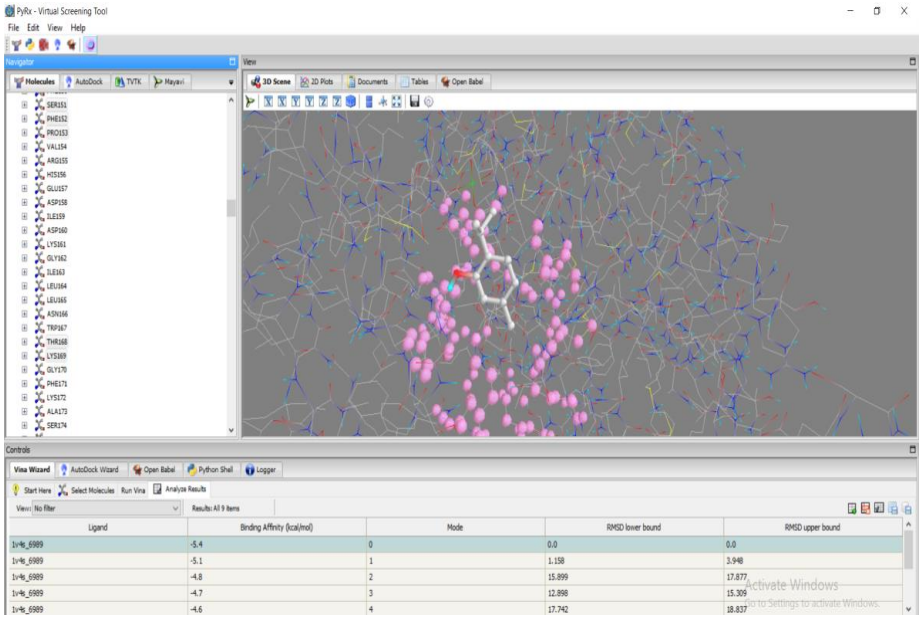

Fig 3.9: The ligand binding with protein is displayed with the binding affinity

3.2 PhytochemicalFormulation of Herbal tea

Spices were gathered from University of Horticultural Sciences, Bagalkote and different flavors in particular were bought from nearby market and online stores.

3.2.1 Sample collection

Fig 3.10: Ingredients used for formulation

- ***Thymus vulgaris*(Thyme leaves)**

  Thyme is a Mediterranean spice with dietary, restorative, and various purposes. The species generally ordinarily developed and utilized for culinary purpose is *Thymus vulgaris*.The blossoms, leaves, and oil of thyme have been utilized to treat various diseases.

- ***Withania somnifera* (Ashwagandha)**

  Ashwagandha, or *Withania somnifera*, is a spice local to Asia and Africa. Additionally called "Indian ginseng," it's been utilized in conventional Indian Ayurvedic medication for millennia to ease agony and aggravation, treat a sleeping disorder, and lift sustenance, alongside different circumstances.

- ***Cymbopogon*(Lemon grass)**

  Cymbopogon, otherwise called lemongrass, security fencing grass, luxurious heads, Cochin grass, Malabar grass, slick heads, citronella grass or fever grass, is a variety of Asian, African, Australian, and tropical island plants in the grass family. A few plant categories (especially *Cymbopogon citratus*) are ordinarily developed as culinary and therapeutic spices in view of their fragrance, looking like that of lemons (Citrus limon). Uses: perfumery, beauty care products, refreshments, seasoning.

- ***Stevia rebaudiana* (Stevia)**

  It is a sweetener and sugar substitute extricated from the leaves of the plant species *Stevia rebaudiana*, local to Brazil and Paraguay. The dynamic mixtures are steviolglycosides (principally stevioside and rebaudioside), which have 30 to multiple times the pleasantness of sugar, are heat-stable, pH-stable, and not fermentable. The body doesn't use the glycosides in Stevie and in this manner it contains 0 calories like a few artificial sweetners. Stevia's taste has a more slow beginning and longer term than that of sugar, and a portion of its concentrates might have an unpleasant or liquorice-like trailing sensation at high fixations.

- ***Aegle marmelos*(Bael fruit)**

  Rich in L-ascorbic acid, the natural products can be eaten either straight from trees or subsequent to being dried and delivered into treats, toffee, mash powder or nectar.With fresh fruit the juice is stressed and improved to make a beverage like lemonade. It was

normally made into sharbet, likewise called as Bela pana, a beverage.Aegeline is a known constituent of the bael leaf and consumed as a dietary enhancement. Bael organic products are of dietary use and the natural product mash is utilized to plan delights like murabba, puddings and juices.

- ***Elettaria cardamomum*(Cardamom)**

Cardamom, in some cases cardamom or cardamom, is a flavor produced using the seeds of a few plants in the genera Elettaria and Amomum in the family *Zingiberaceae*. The two types of cardamom are utilized as flavorings and preparing flavors in both food and drink, and as a medication. E. cardamom (green cardamom) is utilized as a flavor, a masticator, and in medication; it is likewise smoked.

- ***Curcuma longa*(Turmeric)**

Turmeric or *Curcuma longa*, is a lasting spice and individual from the *Zingiberaceae* (ginger) family, and is developed widely in Asian nations. Furthermore, as a medication to treat numerous sicknesses especially as a mitigating and for the therapy of fart, jaundice, feminine troubles, hematuria, discharge, and colic or can be applied as a balm to treat many skin infections. The dynamic constituents of turmeric are the flavonoids curcumin (diferuloylmethane) and different unstable oils, including tumerone, atlantone, and zingiberone.

- ***Cinnamomum zeylanicum*(Cinnamon)**

Cinnamon, the everlasting tree of tropical medication, has a place with the Lauraceous family. Cinnamon is perhaps of the main flavor utilized day to day by individuals everywhere. Cinnamon basically contains fundamental oils and different subsidiaries, for example, cinnamaldehyde, cinnamic acid, and cinnamtic. As well as being a cell reinforcement, calming, antidiabetic, antimicrobial, anticancer and lipid-bringing down.

- ***Ocimum sanctum Linn*(Tulsi)**

Tulsi (*Ocimum sanctum Linn*) is superior, and logical exploration is currently affirming its valuable impacts. There is mounting proof that tulsi can address physical, compound, metabolic and mental pressure through a special mix of pharmacological activities. The utilization of tulsi in everyday customs is a demonstration of Ayurvedic shrewdness and gives an illustration of old information offering answers for present day issues.

- ***ZingiberofficinaleRosc*(Ginger)**

  Ginger (*ZingiberofficinaleRosc*) has a place with the family *Zingiberaceae*. The wellbeing advancing viewpoint of*ZingiberofficinaleRosc*is credited of having high phytochemistry. Rhizome of *ZingiberofficinaleRosc*haveused in conventional home grown medication. It can treat a large number of illnesses by means of immune nutrition and mitigating reactions.

- ***Foeniculum vulgare (*Fennel seeds)**

  Fennel seeds are the dried seeds of the fennel plant, which is a fragrant spice having a place with the parsley family. This spice is regularly known as saunf in Hindi. Both the delightful, crunchy bulb and fragrant seeds of the fennel plant are profoundly nutritious and may offer an overflow of noteworthy medical advantages. Adding them to your eating regimen might further develop heart wellbeing, decrease irritation, smother hunger, and even give anticancer impacts.

- ***Cuminum cyminum* (Cumin seeds)**

  Cumin seed is utilized as a zest for its particular flavor and smell. The seeds of the plant are utilized to make medication. Individuals take cumin for absorption issues including the runs, colic, entrail fits, and gas. Cumin is likewise used to increment urine flow to ease bulging (as a diuretic).

- ***Syzygium aromaticum (*Cloves)**

  Cloves are brimming with cell reinforcements. These mixtures assist your body with battling free radicals, which harm your cells and can prompt illness. By eliminating free radicals from your system, the cell reinforcements found in cloves can assist with diminishing your gamble of creating coronary illness, diabetes, and certain malignant growths.

3.2.2 Preparation of Sample

Newly fresh harvested spices were gathered within field. Spices were spread and on a spotless plate, further they were slashed in the form of modest pieces. Using oven spices were dried for 6 h at 40 °C bringing about dampness of 1-3%. Crushing of dried spices physically and then ground using electric processor which was sieved for 22 mesh size. The powder was put in water proof holder.

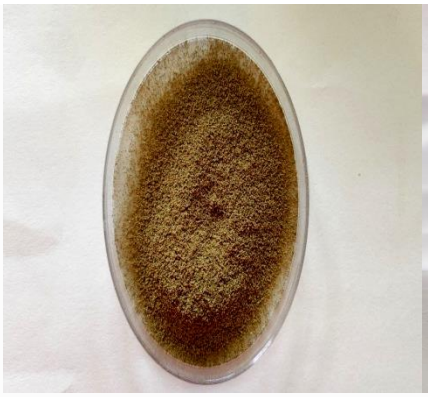

Fig 3.11: Powdered and sieved

Fig 3.12: Stored in a container

3.2.3 Preparation ofother materials

Plant sources are painstakingly reviewed and unwanted substances were eliminated. Lemon grass and tulsi leaves was delicately washed within regular water and slash into around 2 cm pieces utilizing blade which was further spread meagerly on plate, drying usingoven. In the wake of drying, the examples were processed utilizing an electric processor.Processing was carried out for around 15 mins.

3.2.4 Preparation of herbal tea

Herbal tea solution arrangement was made by adding 8 to 10 g of weighed herbal tea powder to 100 ml bubbling water and irregular mixing for 5 min. Thereafter, herbaltea was separated utilizing a channel to eliminate unwanted substance and filled in a container. Further herbal tea was utilized for sensory analysis/tactile examination.

Fig 3.13: Prepared herbal tea

3.2.5 Sensory analysis

For sensory analysis (25) panelists were enlistedwithin Basaveshwar Engineering College for estimating. They weregenerally students which are between 19 and 25 years along withinstitution lecturers. Around 30 ml ofsample (herbal tea) was served using a 40 ml cup. At a time only one sample was served. The temperature maintained for herbal infusions was around 50 °C at the time of tasting. They were told to give ratings for the acceptance using 6 parameters: smell, color, flavor, end taste, sweetness and acceptability. Instructions for the panelists using a 9-point hedonic scale which says that 1 meaning 'disliked' and '9' meaning 'liked'.

Fig 3.14: Herbal tea sample

Fig 3.15: Herbal tea was served for panelists

3.3 Proximate Analysis of Herbal Drink

3.3.1 Determination of carbohydrate

The estimation of carbohydrate using phenol-sulfuric acid method was carried out using 6 clean, dry test tubes. Dilutions using glucose standards and with concentrations of 0.2,0.4, 0.6, 0.8, 1.0 and µg/200 ml were prepared. Then Standard glucose solution was prepared 1 mg per milliliter.Add Distilled water to each test tube and then the tubes are filled with 1 ml of a 5 % solution of phenol. Then add 5ml of Sulphuric acid, and mix it. After addition keep the tubes in water bath for 20 minutes at 25 to 30^0C.Then Check the OD at 490 nm. Record the absorbance and plot the graph.

Calculation:

$$\text{Carbohydrate \%} = \frac{\text{Unknown OD x dilution factor x 100}}{\text{Weight of the sample}}$$

3.3.2Estimation ofprotein (AOAC, 1990)

Estimation of protein was carried out by Kjeldahl technique.There are three steps involved in estimation: Digestion, Distillation and Titration for determining the value of protein present in herbal tea.

Digestion: In digestion flask,weigh0.1 g of sample. 5 g potassium sulfates, 0.5 g anhydrous copper sulfate, are added. Further15 ml$H_2SO_4$was added. Preheating of flask was carried out using preheated burner and it was heated until fumes were seen, further heating continues for 90 minsintended for copper catalyst. Then it was cooled by adding 2% boric acid in each tube and with addition of water (250 ml) to bring room temperature.

Fig 3.16: Kjedahl apparatus

Distillation: HCL (15 ml) and water (70 ml) were taken precisely to form standard solution of acid and it was added to the flask. Further, distillation apparatuswas connected toflask and distillation process is carried outwhich was collected in titrating flask.

Fig 3.17: Distillation unit

Titration: Remaind acid sample was titrated using standard 0.1M NAOH solution which will from colourless to pale pink endpoint and then volume of acid was recorded to nearest 0.01 ml.

Calculation:

$$\%N = \frac{0.014 * \text{Normality (0.1 N)} * \text{I-F} * 100}{\text{Weight of the sample}}$$

$\%P = N\ \% \times 6.25$

3.3.3 Estimation of moisture content(FAO, 1980)

2g sample was kept inside the crucible.The dish was placedalongwith its lid beneathwithin the oven and temperature was maintained for 2 hours at 130-133°C until a steady weight was attained.Take away the dish following 2 hours and then cool using desiccators and measure the value.

Fig 3.18Before analysis

Calculation:

$$\text{Moisture (\%)} = \frac{(W_2 - W_3)}{W_2 - W_1} \times 100$$

3.3.4 Estimation of Fat using soxhlet(AOAC, 1990)

Estimation was carried out using Soxhlet technique. 10 g of samplewas weighed and wrapping is done using a filter paper and kept inside a thimble. Thethimble was connected with a condenser. Solvent used was n-hexane (250 ml).

Fig 3.19 Soxhlet apparatus

Calculation:

$$\text{Fat \%} = \frac{(T+S) - (T)}{RBF_2 - RBF_1} \times 100$$

3.3.5 Estimation of ash contentfor the sample(AOAC, 1990)

2 g of sample was weighed and put in a crucible which was further ignited using a muffle furnace for 6 hours at 550°C. Then sample was cooled through a desiccator and weight of total ash was measured.

Fig 3.20 Muffle furnace

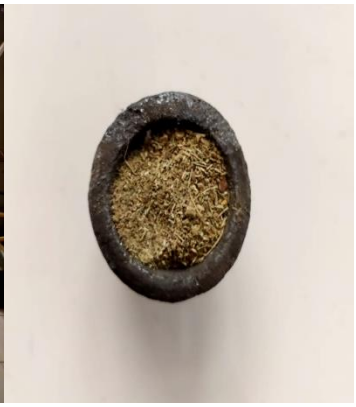

Fig 3.21Before analysis

Calculation:

Total ash = $\frac{(W_3 - W_1)}{W_2 - W_1} \times 100 - M$

3.4 Efficacy test of Herbal Drink on Induced Rats

The experiment was carried outin Bvvs Sangha's HSK pharmacy College Bagalkote.

- ✓ Introduction with respect to :
- ➢ Mice/rat obtainment
- ➢ Treatment of mice and rat
- ➢ Maintenance of animals
- ➢ Examination
- ➢ Sacrificing

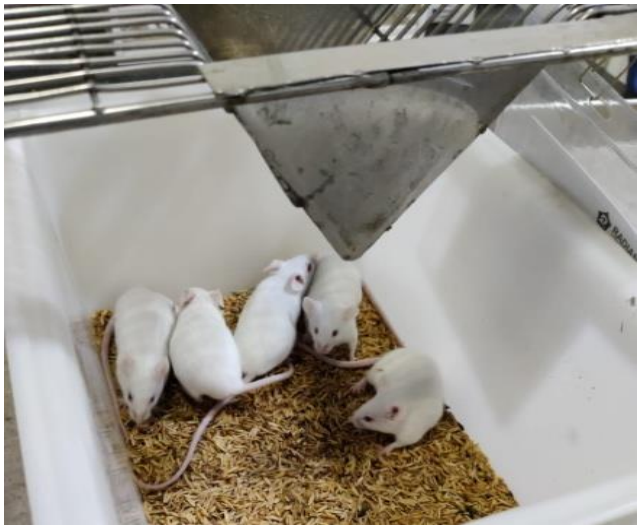

Fig 3.22 Animals at cage

3.4.1 Chemicals:

Alloxan monohydrate was purchased from ALDRICH.

Fig 3.23 Glucose kit

Fig 3.24 Cholesterol Kit

3.4.2 Herbal tea preparation:

Sample was prepared using 0.25 and 0.75 g of formulated herbal tea powder with the addition of 100 ml of hotwater forirregular mixing upto 10 mins and was cooled for 15 mins. After that the sample was filtered through a channel to remove unwanted substance then pouring into clean flask and further it was given to 2 groups.

3.4.3 Recruitment of animal and diet:

Male BALB/C mice (15-25 g) were obtained from Mahaveera Enterprises, Telangana and were carried out in Bvvs Sangha's HSK pharmacy College Bagalkot. They were kept under ecological circumstances. Theywere taken care of accurate pellet diet and water ad libitum.Each enclosure contains 4 mice with a bedding of husk. The enclosures were cleaned day to day by changing the husk bedding. All through the treatment period, rats were weighed (one time per week) and food admission was noted down.

3.4.4 DiabetesInduction:

Diabetes induction was carried out using an intraperitoneal injection of alloxan for the required dose 40 mg/kgweight of bodywhich was disintegratedwithin a citrate buffer. After 3 days mice was estimated for increase in glucose level in blood for more than 200 mg/dL are estimated as treatment mice and reviewed.

Fig 3.25 Induction of diabetes in mice by Alloxan

3.4.5 Design of experiment:

The mice were arbitrarilydivided into 4 groups containing 4 animals in each cage.

- ✓ **Group1(normal): BALB/C Mice** orally receive Plain vehicle for 14 days

Fig 3.26 Group 1(Normal)

- ✓ **Group 2(control): BALB/C** Mice received alloxan monohydrate and served as diabetic control mice.

Fig 3.27 Group 2(Control)

- ✓ **Group 3(treatment I): Diabetic** Mice orally receive Herbal tea sample (0.25 g/100 ml) in substitution of water.

Fig 3.28 Group 3(Treatment I)

- ✓ **Group 4(treatment II): Diabetic** Mice orally receive Herbal tea sample (0.75 g/100 ml) in substitution of water.

Fig 3.29 Group 4(Treatment II)

3.4.6 Process Flow sheet

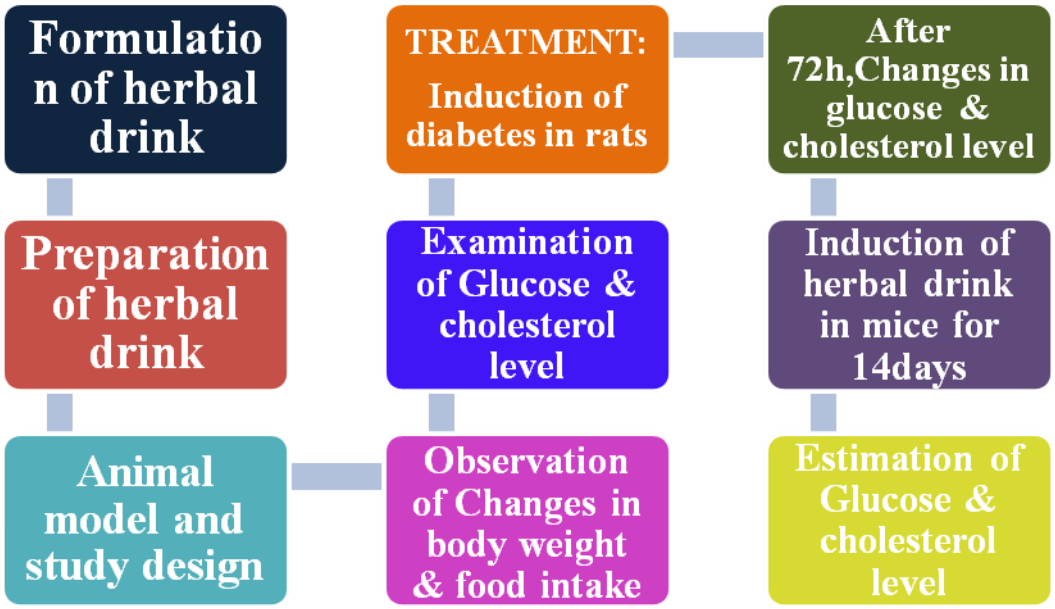

Fig 3.30 Flowchart for clinical studies

3.4.7Biochemical Assays:

Blood Glucose and Cholesterol Estimation:

Assay Procedure

Fig 3.31 Mice were anesthetized with diethyl ether and blood test was gattered in Eppendorf tubes

Fig 3.32 Serum was separated after centrifugation of blood without anticoagulants at 3000rpm for 10mins

Fig 3.33 12 test tubes were taken and Serum was measured by using an enzyme immunoassay kit with standard laboratory techniques and HDL, LDL and VLDL were estimated.

Fig 3.34 measured photometrically at 505nm.

Calculation:

$$\text{Glucose(mg/dl)} = \frac{\text{Absorbance of Test}}{\text{Absorbance of STANDARD}} \times \text{Concentration}$$

3.4.8Changes in Weight of body and Intake of food

Weight of body and intake of food consumption for every mice in every one of the gatherings were estimated day to day all through the review period by utilizing a weighing balance and the progressions were recorded.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Estimating ligands following Lipinski's rule and blood brain barrier

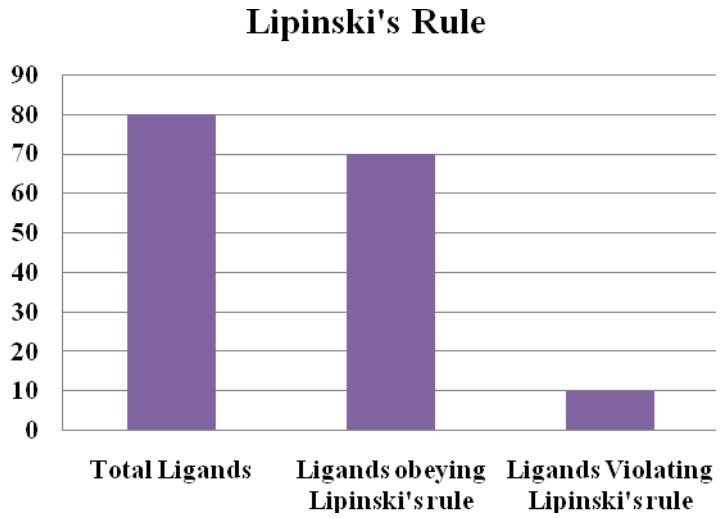

Fig 4.1: Graphical representation of ligands based on Lipinski's rule.

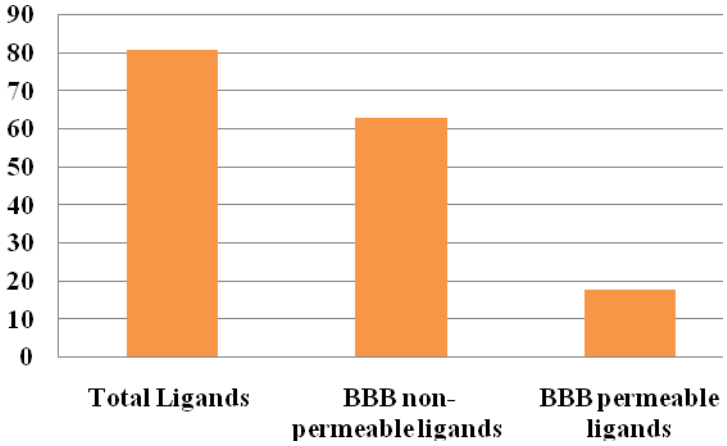

Fig 4.2: Graphical representation of ligands based on BBB.

Table 4.1: The ligands with their respective binding affinities (kcal/mol)

Sl No	Ligand	Binding Affinity (kcal/mol)
1.	Aegeline	-7.0
2.	Clausenaline E	-6.5
3.	Murrayanine	-6.6
4.	Xanthotoxol	-6.9

5.	Maackiain	-7.9
6.	Formononetin	-6.8
7.	Diethyl nitrosamine	-4.2
8.	4-methylcatechol	-5.2
9.	Alpha-methyl cinnamic acid	-5.5
10.	4-fluoro cinnamic acid	-5.6
11.	Ethyl p-methoxy cinnamate	-5.4
12.	Coumarin	-5.9
13.	Abietic acid	-4.4
14.	Sandracopimaric acid	-2.6
15.	Dehydroabietic acid	-5.4
16.	Pinoresinol	-6.5
17.	Thymol	-5.4
18.	Falcarinol	-0.7

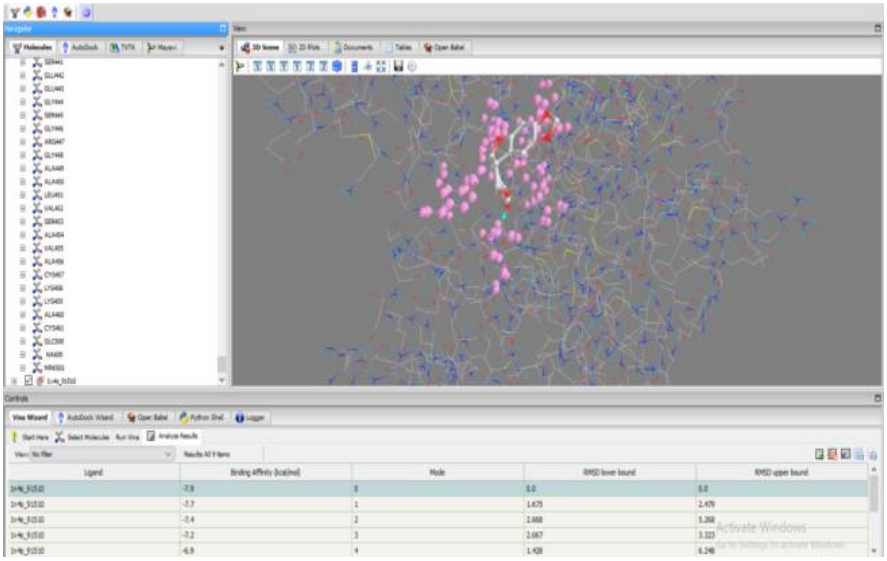

Fig 4.3: Binding affinity of Maackiain with 1V4S

The protein-ligand complex plays an important role in insilico studies.The phytochemicals which binds to a receptor inhibits its function and act as medication.81 phytochemicals were screened utilizing Lipinski's rule and ADME properties. For the current review 81 ligands were taken. Out of 81 ligands 70 ligands could go through the Lipinski's rule without violating any standard. While, then 18 ligands are able to pass the BBB (Blood Brain Barrier). Thus, 18 ligands (which are mentioned in table no 6)are able to fulfill the standards of both Lipinski's standard and ADMET properties.The quality assessment value of the

protein was 2.3 A° representing the suitability for drug designing because value above 1.5 A°is an ideal protein for insilico studiesand also the sequence length of protein is 455.Thus it helps to recognize interactions of molecules. Similarly, fig (2) reveals the binding site of protein and maackiain. The protein (1V4S) residues Glu290, Tyr168 and Gln287 forms H-bond with Maackiain. Binding ability of Glucokinase with Maackiain indicates the ligand has strong interaction with 1V4S protein.The Phytochemical which showed higher negative binding energy is the most efficient in the treatment of Diabetes mellitus. The binding affinity should be ranging from -5 kcal/mol to -8 kcal/mol. Falcarinol ligandhavethe lowest binding affinity while Maackiain have the highest binding affinity. Thus, the most efficient among the other ligands is Maackiain used for drug designing and have good ability in treating diabetes disease. The significance of phytochemicals has been realized and its usage will help for individual wellbeing. Thus, Computational biology will be boon to the pharmaceutical world.

4.2 Nutritional Analysis

4.2.1 Determination of Carbohydrate

Fig 4.4 Phenol sulfuric acid method

Table 4.2: Determination of Carbohydrateby phenol-sulfuric acid method

Sl.No	Standard	Concentration	Distilled water	Phenol	Sulfuric acid		OD at 490 nm
1.	0	0	1	1	5	Incubation for 20 minutes at room temperature	0
2.	0.2	20	0.8	1	5		0.24
3.	0.4	40	0.6	1	5		0.4
4.	0.6	60	0.4	1	5		0.6
5.	0.8	80	0.2	1	5		0.81
6.	1	100	0	1	5		0.94

Table 4.3: Percentage of Carbohydrate

Slope	Intercept	Unknown OD	Carbohydrate
0.009	0.026	0.24	23.7

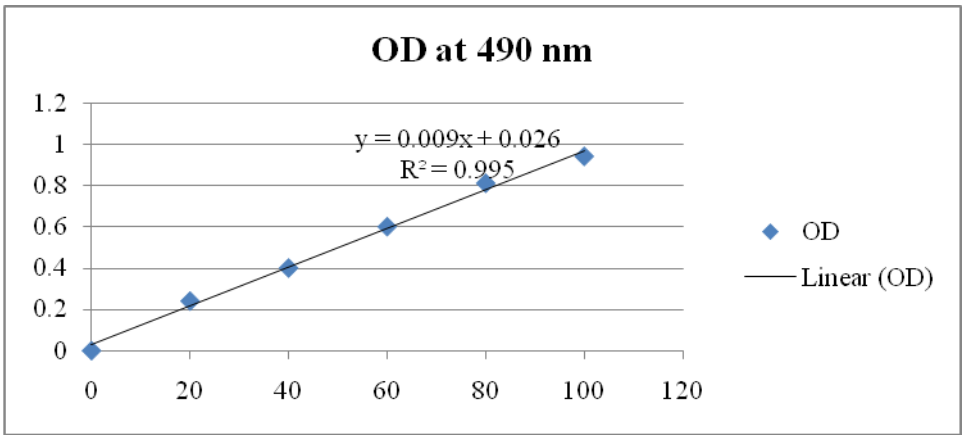

Fig 4.4 Estimation of Carbohydrate

The total carbohydrate present in herbal tea was 23.7 µg/ml.

4.2.2 Determination of Protein

Fig 4.5 Titration

Calculation:

$$\text{Nitrogen \%} = \frac{0.014 \times 0.1\ N \times (0.2 - 2.5) \times 100}{0.1}$$

= 3.22 %

Protein % = 3.22 x 6.25

= 20.12 %

The complete protein assessed for herbal tea was 20.12% and the level of nitrogen was 3.22% for 100g of sample. By referring the above paper [29] the protein content was 26.3% for 100g of sample. So the protein present in 100g of herbal tea samplefalls in the range from 20 to 28%.Thus acquired protein falls in between the range of standard value.

4.2.3 Determination of Moisture

Fig 4.6 After analysis

Calculation:

Moisture content = $\frac{44.153 - 43.971}{44.153 - 42.098}$

= 6.5%

The total moisture content of herbal tea is 6.5% which falls in the range of standard value from 6 to 10% in accordance with AOAC.

4.2.4 Determination of Fat

Fig 4.7 Remained fat

On the basis of AOAC, The total fat content determined was 0.52%

4.2.5 Determination of Ash

Fig 4.8After analysis

Calculation:

$$\text{Ash content} = \frac{22.693 - 22.524}{24.653 - 22.524} \times 100 - M$$

$$= 8.5\%$$

The Association of official analytical chemists has procedural specifications and terms of criteria which are used for analysis of food product samples. According to this the total ash content in herbal tea sample is 8.5% which falls in the range of standard value.

4.3 Sensorial analysis of herbal tea

Analysis of sensory for the sample was carried out for acceptability test (color, fragance, Taste,Sweetness, acceptability and end taste) by means of 20 panelists using 9-point Hedonic scale.

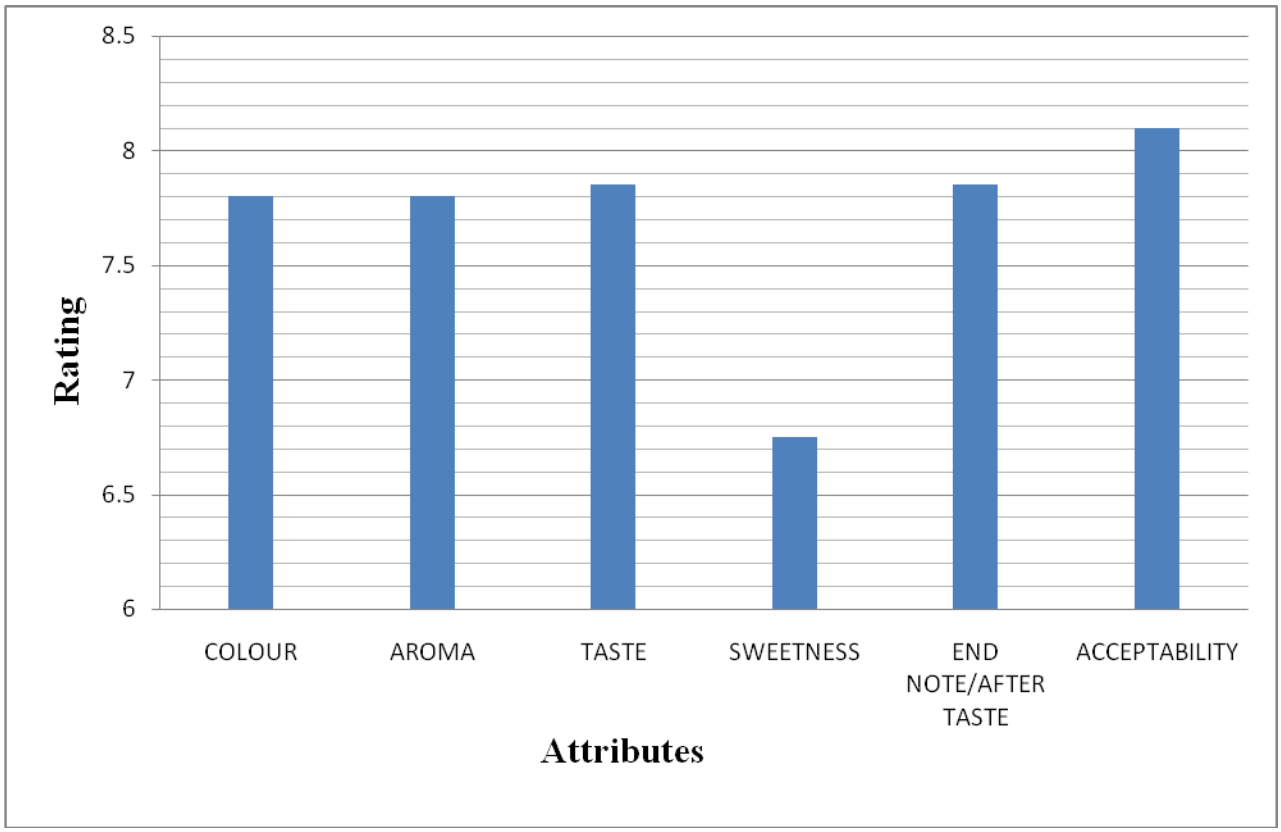

Fig 4.9: Graphical representation of sensory attributes

Analyzing the graph along with its score given by the panelists has highest ratings for its acceptability and taste.Sweetness of herbal tea was least liked by the evaluators.

4.4 Checking the efficacy of herbal tea

4.4.1 Changes in body weight

Table4.4: Body weight observed First week (Start of the induction period)

Experiment no.	Gender	Weight	Food intake
Normal 1)	M	20gm	18.2 gm
2)	M	20gm	
3)	M	20gm	
4)	M	20gm	
Control 1)	M	20gm	20.1 gm
2)	M	20gm	
3)	M	20gm	
4)	M	20gm	
Treatment I 1)	M	20gm	18.5 gm

2)	M	17gm	
3)	M	19gm	
4)	M	20gm	
Treatment II 1)	M	21gm	19.6 gm
2)	M	19gm	
3)	M	21gm	
4)	M	19gm	

Table 4.5: Body weight observed second week

Experiment no.	Gender	Weight	Food Intake
Normal 1)	M	20gm	22.6gm
2)	M	20gm	
3)	M	20gm	
4)	M	20gm	
Control 1)	M	20gm	20.5gm
2)	M	20gm	
3)	M	20gm	
4)	M	20gm	
Treatment I 1)	M	26gm	24.2gm
2)	M	19gm	
3)	M	20gm	
4)	M	24gm	
Treatment II 1)	M	26gm	23.6gm
2)	M	22gm	
3)	M	24gm	
4)	M	21gm	

Table 4.6: Body weight observed third week

Experiment no.	Gender	Weight	Food Intake
Normal 1)	M	20gm	20.1gm
2)	M	20gm	
3)	M	20gm	
4)	M	20gm	
Control 1)	M	20gm	21.3gm
2)	M	20gm	
3)	M	20gm	
4)	M	20gm	
Treatment I 1)	M	30gm	24.9gm
2)	M	22gm	
3)	M	22gm	
4)	M	30gm	

Treatment II	1)	M	Death	23.0gm
	2)	M	26gm	
	3)	M	30gm	
	4)	M	24gm	

Table 4.7: Body weight observed fourthweek (at the end of induction period)

Experiment no.		Gender	Weight	Food Intake
Normal	1)	M	20gm	22.2gm
	2)	M	20gm	
	3)	M	20gm	
	4)	M	20gm	
Control	1)	M	20gm	20.2gm
	2)	M	20gm	
	3)	M	20gm	
	4)	M	20gm	
Treatment I	1)	M	32gm	23.8 gm
	2)	M	24gm	
	3)	M	23gm	
	4)	M	31gm	
Treatment II	1)	M	Death	24.5gm
	2)	M	28gm	
	3)	M	32gm	
	4)	M	26gm	

Obesity is strongly associated with Diabetes and present in up to 50 % of cases. At the start of the induction period after inducing alloxan body weight was increased for 14 days respectively.

4.4.2 Determination of Blood Glucose and Cholesterol Level

Table 4.8: Estimation of blood glucose level

Days	Normal	Control	Treatment I	Treatment II
0	79.61	80.41	75.5	71.25
3	80.5	202.73	223.36	209.97
7	82.6	199.29	153.82	151.39
14	82.91	192.62	140.64	130.29

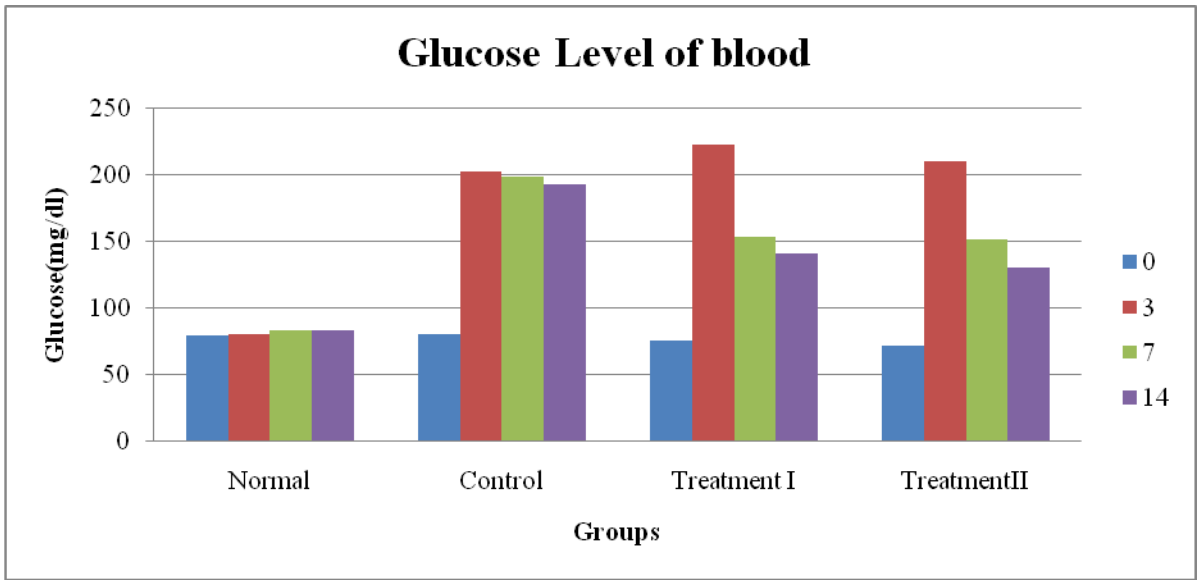

Fig 4.10 Graphical representation of blood glucose level in mice

Table 4.9: Estimation of cholesterol level

Days	Normal	Control	Treatment I	TreatmentII
0	59.57	62.53	43.84	45.96
3	63.43	136	145.05	135.75
7	65.39	136.37	99.32	93.08
14	57.2	124.18	72.51	70.24

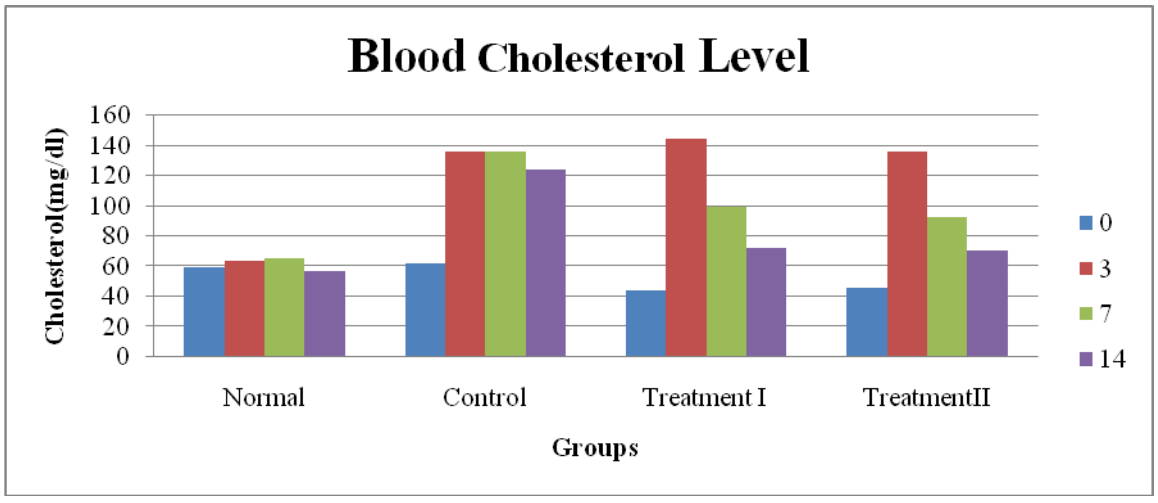

Fig 4.11 Graphical representation of blood cholesterol level in mice

Medicinal/Restorative plants are used for creating novel medicines.Several plants seemed to be utilized for further develop glucose resilience and awareness of insulin in cure of diabetes mellitus. Plants which are antihyperglycemic and anti-hyperlipidemic are used for treating the disease.In this study the herbal tea concentrate at a measurement of 0.75 g/100 mlwas found to have potential antidiabetic activity after 24 h of the treatment. The administration of herbal tea concentrate at similar portion for 14 days in alloxan prompted diabetic mice which brought about lower level in Glucose and Cholesterol levels compared to normal and control mice. On seventh day after inducing alloxan there was significant increase in weight of body and intake of food.The increase in intake of food from 3 to 5 gms /24 hrs from 0th day to 14th day in normal and control groups. Similarly, in treatment I and II groups food intake is increased from 5 to 8 gms /24 hrs from 0th day to 14th day respectively. Thus, food intake is higher in treatment groups then in normal groups. The increase in body weight of mice from 20 gms on 0th day to 25 gms on 14th day in normal groups. But in treatment groups there is increase in body weight which occurs from 25 gms to 30 gms during the period.The glucose level at 130.29 mg/dl concentrate showed decrease in blood glucose level of mice(treatment II) which was shown graphically in fig (44). The estimated cholesterol level at 70.24 mg/dl concentrate showed decrease in blood cholesterol level of mice(treatment II) which was shown graphically in fig (45). Thus, the study concludes that herbal tea exhibited antidiabetic activity and improvement in weight of body and intake of food in normal and treatment groups.

CHAPTER 5

CONCLUSION

Diabetes mellitusis the seventh driving reason for death of human.However, medications are available but are not effectual, so there is a need to change the drug of necessity, plant based metabolites can be potential as they do not have side effects. In addition there is a need to formulate an effective Phytochemical which will contribute in regulating sugar level in the blood. For the same function drug designing which can be promising and will help specific target based drugs that will act precisely and help in commercial formulations of drugs for pharma industries. In the current study an attempt was made to find the effective phytochemical against diabetes through molecular docking/insilico studies. Altogether 81 phytochemicals were docked and 70 viewed as successful and out of which 18 phytochemicals were still better in terms of Lipinski's standard and BBB (Blood Brain Barrier) which was docked through PyRx programming involving Glucokinase as a transporter protein. The study had revealed the extent/scope of molecular docking for diabetes mellitus using phytochemicals. Molecular docking saves the time and cost effective experiments can be performed based on the results. Among 18 phytochemicals Maackiain had (-7.9 kcal/mol) indicating the usage of molecule in Nutraceuticals or other health supplements in reducing blood sugar level.

Further, using 18 phytochemicals(Aegeline, Clausenaline E, Murrayanine, xanthotoxol, Maackiain, Formononetin, Diethyl nitrosamine, 4-methylcatechol, Alpha-methyl cinnamic acid, 4-fluoro cinnamic acid, Ethyl p-methoxy cinnamate, Coumarin, Abietic acid, Sandracopimaric acid, Dehydroabietic acid, Pinoresinol, Thymol, Falcarinol) which were effective in docking. These were utilized in phytochemical herbal tea formulation.Outcome of the nutritional report prove that the combination of spices have an incredible source of therapeuticallyhigh value.An herbal tea contains infusion of mixes with different herbs, seasonings and restorative natural-resources.This herbal tea has popular owing to its aroma as well as acceptability properties. This herbal tea can be used in hot or cold form to improve individual wellbeing. This tea is in demand, but also well-known for its palatability and so making it a good product in the perspective of individual wellbeing.While, sensorialanalysis subjectto many customers greater than individual wellbeingbenefits, as a result the formulated herbal tea make available withnovel alternative to long-established flavor teas which provideswellbeingin treatment of diabetes.

To overcome this disease, further in vivo studies was carried out in which herbal tea showed decrease in the blood glucose level, increase in weight of body and intake of food and reduction in lipid levels of blood in mice. Moreover, improving the function of liver and kidney which are primary elements associated with diabetes mellitus.The effectualtreatment of herbal tea was 0.75 g/100 ml.The glucose and cholesterol level at 130.29 mg/dl and 70.24 mg/dl concentrate showed antidiabetic activity in mice.

FUTURE SCOPE

This dissertation has commercial potential;product obtained can be used by every individual in our society so that they could live a healthy life.This will help entrepreneurs to gain more knowledge in the field of molecular docking.This project provides wide reservoir of knowledge to the pioneersand researchers in the field of herbal tea production.This will also saves time and helps to accelerate the research.

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CERTIFICATE

This is to certify that the project work entitled "NEW PRODUCT DEVELOPMENT: ZERO MALT *SPIRULINA*-BASED BEVERAGE MIX is a work carried out by Miss Swati Shantaveerayya Gavimath, bearing USN: 2BA20FBT06, in partial fulfillment for the award of M.TECH FOOD BIOTECHNOLOGY, in the Department of Biotechnology, Basaveshwar Engineering College (Autonomous) Bagalkote, affiliated to Visvesvaraya Technological University, Belgavi during the academic year 2021-2022. To the best of our knowledge, the work reported in the thesis has not been submitted by the candidate elsewhere for the award of any other degree and is not the repetition of the work carried out by others. It is certified that all corrections and suggestions indicated during internal assessment have been incorporated in the report.

Dr Sharada P	Mr Manoj Ramesh	Dr Bharati S Meti	Dr S S Injaganeri
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New product development: Zero malt *Spirulina*-based beverage mix

A project report
submitted to the Department of Biotechnology in partial fulfillment of requirement for the award of the degree

M.Tech in
Food Biotechnology

Submitted by
Miss Swati Shantaveerayya Gavimath
USN: 2BA20FBT06

Under the guidance of
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DECLARATION

I, Swati Shantaveerayya Gavimath bearing USN: 2BA20FBT06, Department of Biotechnology, Basaveshwar Engineering College (Autonomous) Bagalkote, hereby declare that the dissertation entitled **"New Product Development: Zero Malt *Spirulina*-Based Beverage Mix"** is carried out by me in partial fulfillment for the award of Master of Technology in **FOOD BIOTECHNOLOGY** at **Basaveshwar Engineering College (Autonomous) Bagalkote**, during the year 2021-2022, under the guidance of **Dr Sharada P.** To the best of my knowledge, the work reported in the thesis is my original work and has not been submitted by me elsewhere for the award of degree and is not the repetition of the work carried out by others.

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The satisfaction and euphoria that accompany the successful completion of our task could be incomplete without mentioning the people who helped and supported in the accomplishment of the project, whose constant guidance and encouragement resulted in its realization.

I am thankful to my guide **Dr Sharada P**, Associate Professor, Department of Biotechnology, who saw me through the whole project. The project would never have progressed without the valuable guidance of my guide. Her contribution to the project is unbounded and mere words are enough to express my gratitude.

I take this opportunity to express my gratitude to **Mr Manoj Ramesh**, Co-founder and **Ms Suprita Revankar**, Research Associate at Plankt Biosystems, Bagalkote for providing me all the necessary facilities and guiding me constantly till the end of my project work.

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I avail this opportunity to express my sincere thanks to our beloved Principal **Dr S S Injaganeri,** for providing me with the laboratory facilities.

I avail this opportunity to express gratitude to **Dr. Jayachandra S. Yaradoddi** Assistant Professor and PG Project Co-coordinator.

I am very much grateful for the support provided by Plankt Biosystems Pvt.Ltd and Science-Technology Entrepreneurs Park, Bagalkote.

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Swati Shantaveerayya Gavimath

ABSTRACT

India is one of the largest consumers of malted-health drinks. Brands like Bournvita, Boost, Complan and so on have acquired top positions in the market. These products are marketed as “healthy and tasty”. Though they are tasty, nutritional facts are not clearly labeled on the packaging of these products. Products are incorporated with more carbohydrates, sugars, artificial flavors, colors, preservatives and natural identical substances which provide enriched taste and not so good amounts of nutrition. Additionally, products are not reasonable for the financially disabled population where malnutrition is seen which was the major reason why these products were introduced in India after independence. Also, gym, sports and health enthusiasts are finding replacements for whey protein powders to switch completely to vegan. Whey protein which is obtained from dairy milk has its own demerits such as decreased appetite, nausea, lactose intolerance, headache, obesity related risks due to saturated fat, can cause cancer and heart related disorders.

On the contrary to malted-health drinks, spirulina-based beverage mix powder is developed. Spirulina is a cyanobacteria and is called a single cell protein. This microalgae is rich in protein, antioxidants, pigments and trace minerals. Spirulina has its own positive health impacts when consumed. It aids weight loss, anemia, boosts immunity, enhances loss of appetite, cures oxidative stress and so on. It also has effects like an antiviral, antibacterial and anti-inflammatory.

Novel spirulina-based beverage mix is developed using main ingredient as spirulina, cocoa as flavor enhancer, moringa as minerals and vitamin supplement, stevia as zero calorie natural sweetener, nutmeg to mask fishy odor of spirulina, salt to balance sweetness and xanthan gum to provide thickness and uniform ingredient dissolution. The developed product is analyzed for nutritional, sensory, shelf-life and its acceptance among consumers. According to the present research work of spirulina mix development, the product provides protein, vitamins, minerals and goodness to gym enthusiasts, children and the general population as well.

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Abbreviations

RTE :	Ready to Eat
RTS :	Ready to Serve
NFHS :	National Family Health Survey
UNICEF :	United Nations International Children's Emergency Fund
DHA :	Docosahexaenoic acid
INS :	International Numbering System
PETA :	People for the Ethical Treatment of Animals
EDTA :	Ethylenediamine tetraacetic acid
OD :	Optical density
ALA :	Alpha-lipoic acid
EPA :	Eicosapentaenoic acid
CAGR :	Compound Annual Growth Rate
CMC :	Carboxymethyl Cellulose
CFU :	Colony Forming Unit
SPC :	Standard Plate Count
RTS :	Ready to Serve
PCA :	Plate Count Agar
DOE :	Design of Experiments
AOAC :	Association of Official Agricultural Chemists
CLT :	Central Location Test

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CERTIFICATE

This is to certify that the project entitled, "Development of Multigrain cookies" is a work carried out by Miss. Tejaswini R Megeri bearing USN: 2BA20FBT07, in partial fulfilment for the award of M.Tech Food Biotechnology, in the Department of Biotechnology, Basaveshwar Engineering College (A), Bagalkote, affiliated to Visvesvaraya Technological University, Belagavi during the academic year 2021-2022. To the best of our knowledge, the work reported in this dissertation has not been submitted by the candidate elsewhere for the award of any other degree. It is certified that all corrections, suggestions indicated during Internal assessment have been incorporated in the report.

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DEVELOPMENT OF MULTIGRAIN COOKIES

A Project report
submitted to the Department of Biotechnology In partial fulfilment of requirement for the award of the degree

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DECLARATION

I, Tejaswini R Megeri bearing USN: 2BA20FBT07, Department of Biotechnology, Basaveshwar Engineering College (Autonomous) Bagalkote, hereby declare that the dissertation entitled **"Development of Multigrain cookies"** is carried out by me in partial fulfilment for the award of Master of Technology in **FOOD BIOTECHNOLOGY** at **Basaveshwar Engineering College (Autonomous) Bagalkote**, during the year 2021-2022, under the guidance of **Dr. Bharati S Meti** . To the best of my knowledge, the work reported in the thesis is my original work and has not been submitted by me elsewhere for the award of degree and is not the repetition of the work carried out by others.

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I avail this opportunity to express gratitude to **Dr. Jayachandra S. Yaradoddi** Assistant Professor and PG Project Co-coordinator.

I avail this opportunity to express my sincere thanks to our beloved Principal **Dr. S. S. Injaganeri**, for providing us with all the necessary facilities.

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Tejaswini R Megeri

ABSTRACT

Baking Industry is considered as one of the major segments of food processing in India. Bakery products have become popular among different cross sections of the population due to an increased demand for convenience foods. Cookies, among the bakery products, are most significant in the world. These are an important food product used as snacks by children and adults. Cookies differ from other baked products like bread and cakes due to their low moisture content which ensures that they are free from microbial spoilage and confer a long shelf life on the product. The present study is an attempt to formulate higher nutritional value of cookies with added health benefit by addition of whole wheat flour, finger millet flour and oats flour along with the addition of chia seeds. Sugar is replaced by jaggery power. In the present study, C1, C2, C3 and C4 were formulated in which multigrain cookies were prepared by using whole wheat flour: Finger millet flour: Oats flour (WWF: FMF: OF) in the ratio of (40:15:15, 15:40:15, 15:15:40, 23.3:23.3:23.3) respectively. Among all the formulations C2 and C4 were mostly liked by all the panelists. Proximate analysis was carried out for the four formulations, where the moisture content ranges between 3.3 to 3.7%., total ash ranges between 0.86-0.95%, acid insoluble ash ranges between 0.07 -0.09%, fat content ranges between 7.2-9.3%, acidity of extracted fat ranges between 0.9-1.22%, protein ranges between 11.5-13.8% and carbohydrate ranges between 67- 78.4%. The shelf-life studies revealed that the cookies can be stored for 30 days and can be eaten.

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B.V.V. Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS)
BAGALKOT-587102

REPORT OF IN-PLANT (UAU708L)
AT

BEC-BOSCH REXROTH CENTRE

(INDUSTRIAL AUTOMATION)

Submitted in partial fulfillment of the Bachelor of Engineering
In
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[For the Academic Year 2021-22]

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Industrial Automation organized by BEC- BOSCH REXROTH
Regional Center of Competence for Automation Technologies,
Basaveshwar Engineering College, Bagalkot during
30-08-2021 to 29-09-2021. This internship has covered Pneumatics,
Electro- pneumatics, Hydraulics, Electro- hydraulics,
PLC and Mechatronics Programming.

For Bosch Rexroth (India) Ltd.

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ABSTRACT

Automation is one of the promising technologies to reduce the need for human work the production of goods and services. Automation greatly reduces the need of human urement in industries. To make the working in the industry we make use of automation following parts, pneumatics, hydraulics, plc and mechatronics Industrial Pneumatics erts the energy of compressed air into movements and forces for machine drive is by means of cylinders and motors which are controlled by valves. Electro ematics is also used in the industry to make the working of a system using electrical w system. Hydraulic systems convert mechanical energy into hydraulic energy, transport In this form in an open or closed-loop controlled way and then re-convert it into chemical energy, Pressure oil supply to a hydraulic cylinder by a hydraulic power unit. ang of a simple power unit on the basis of parameters specified by the customer. If we pe of hydraulics in mechanical, vehicle and aircraft engineering, we understand by this the practical application of this discipline of physics in the fields of power transmission and and closed-loop control technology. A PLC is a microprocessor-based controller with triple inputs and outputs. It uses a programmable memory to store instructions and carry unction to control machines and processes. Using this PLC we control the pneumatic hydraulic operation where it reduces the complexity of the connection. The combination mechanical and electronic systems and Design engineering to create useful mechatronies. In this industrial training we went through the entire working of ates, hydraulics, PLC, and mechatronics.

INDUSTRIAL AUTOMATION : About BOSCH REXROTH

Bosch Rexroth is one of the leading specialists in the field of drive and control chnologies Rexroth represents a one-stop source for all drive and control technologies provides productive, energy efficient and customized solutions. Bosch Rexroth, the drive and control company has a history of more than 200 years. It has more than 33,700 ates working at production and customizing sites in 22 countries in addition to sales ciates in 80 countries, who achieved earnings of approximately EUR 5.6 billion in 2014

11 BRIEF HISTORY

In 1795 Georg Ludwig Rexroth puts a water-powered hammer mill into operation in Elsavafal(spessart), thus signalling the start of the company's illustrious history. In 1850 following the acquisition of the Stein'schen EisengieBerej iron Foundry in lohr, the company establishes its headquarters in this city in Germany's Maintal Region. In 1930 Rexroth develops high-quality specialist castings. In 1952 company started producing andardized hydraulic components and hydraulics. First industrialized gear pump for mobile machines was strted in 1953.Special gear pumps and block valves were constructed the year 1959.

In 1960 pipe-free valve configurations using block assembly form the basis for new hydraulic applications in all industry sectors were established. 1962 is considered as the development of a dual-circuit system for the hydraulic control of diggers. First short Production run of radial piston pumps with three pistons and hydro-Giant axial piston units Program in modular system was started in year 1964, Rexroth sets up a specialist department for electronic control and control units in 1972 Rexroth launched the first hydraulic servo valve onto the market. Proportional valve 1966. Swash plate axial piston units for mobile machines were started in year 1968.

Rexroth becomes a wholly owned subsidiary of Mannesmann AG in 1975. Mennesmann Rexroth acquired Brueninghaus GmbH as well as its production of axial piston pumps and motors in year 1976.

Bosch in India:

Bosch entered India in 1922, when Company set up sales office in Calcutta For tree decades, the company operated in the Indian market only through imports. In 1951, Bosch set up its first manufacturing plant in India Currently. Bosch India has turnover of over $2 billion and ever 26000 employees spread across 10 locations and application development centres 54% of Bosch India revenues come from its automotive business, with the remaining 16% split between in non-automotive businesses that include packaging, energy and building solutions, power tools and consumer retail, Bosch also has an R&D facility in Bangalore, India. This is Bosch's larger RAD facility outside its home market of In September 2014, Bosch announced the launch of locally developed eye-care solution in India. The company's new eye screasing and dissection system offers nomination of band ware and software and provides affordable eye care. Bosch India is listed on the Indian stock exchanges and has market capitalization of over $12 billion

INDUSTRIAL AUTOMATION: INTRODUCTION

Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services Automation greatly educes the need of human requirement in industries. Automation plays an increasingly important role in the world economy and in daily experience.

ADVANTAGES OF AUTOMATION:

Replacing human operators in tasks that involve hard physical or monotonous work

Replacing humans in tasks done in dangerous environments (ie fire, space, volcanoes, nuclear facilities, underwater, etc). Economy improvement: Automation may improve in economy of enterprises, society or most of humanity. The goals of automation are precision, reliability, health, safety

LIMITATIONS

- Unemployment increases due to machines replacing humans.
- Unpredictable development costa.
- High initial cost

AUTOMATION DEPARTMENTS

- Mechanical engineering
- Electronics engineering
- Automobile engineering
- Mechatronics

Rexorth Bosch department of BEC Bagalkot contain many such departments like Pnuematics, Hydraulics, Plc's and Mechatronics. There are many experience hands in all departments who got trained in the Germen centre.

Pneumatics:

PNEUMA: means "Breath or Wind" in Creek word. "Pneumatics is the name given to the branch of physics which treats with the properties, motions and behavior of Air Industrial Pneumatics coverts the energy of compressed air into movements and forces for machine drive mechanisms by means of cylinders and motors which are controlled by valves.

FEATURES OF PNEUMATICS

- High Speed
- Inexpensive and mature technology.
- Easily available, Low on cost.
- Reliability.
- Long service life.
- Storage
- Transportable - No loss of power during storage
- Safety Can be used in hazardous / sensitive or clean room areas like Coal Mines, Petroleum Refining. LPG Bottling, Medicine & Pharma

ADVANTAGES OF PNEUMATICS

1. Air exists freely in atmosphere no problem like depleting resources

2. in Air drop in pressure is not large. In Hydraulics, Retum lines are required. It can be transported over a large distance up to 1000 meter. You cannot take oil in hydraulics for 100 meter.

3.Temperature Change in the Temperature does not affect the Steady State performance of the system.

4.Cleaning - Leaking Pipes does not Contaminate. It is used in Food & Pharma, chemical, Textile, Printing Inks, etc

5.Air does not burn. The working pressure around 6 Bar

6.Cost-Initial cost is high but maintenance cost is Total cost minimum economical.

PNEUMATICS APPLICATIONS IN INDUSTRY

1.Automobile Production.

2 Petroleum Refining

3. Petrochemicals

4. Food & Confectionery. $ Packaging & Handling

6 Machine Tools

7. Robotics

8.Electronics - Pick and place.

BASIC STRUCTURE OF PNEUMATIC SYSTEM

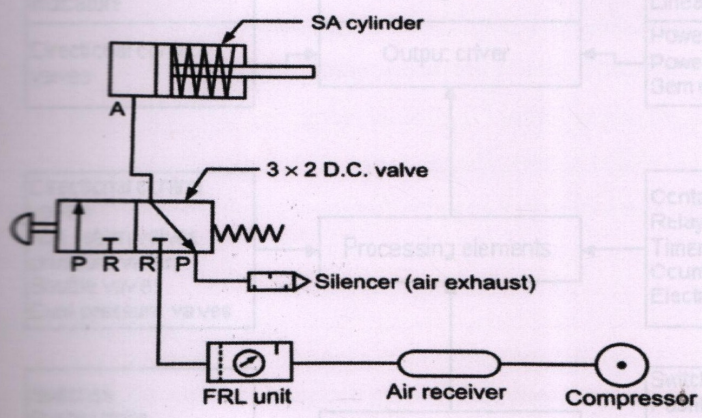


Fig. 1 Basic structure of Pneumaties

Components of Pneumatic system:

- Air Compressor
- Prime Mover (Electric Motor ICEngine)
- Air Tank
- FRL Unit (Filter Regulate/Lubricate)

- Valves (DCV, FCVs, PCVS)

- Connections (Piping)

- Auxiliary components (Accumulator)

ELECTRO-PNEUMATICS

Electro-pneumatic control

Pneumatic systems widely used for large applications. In Electro Pneumatics, either AC or DC source is used as the signal medium. Operating voltages from around 12 V to 220 Volts are often used. consists of electrical control systems operating pneumatic power systems. In this solenoid valves are used as interface between the electrical and Electro Pneumatic control integrates pneumatic and electrical technologies and is more accurate.

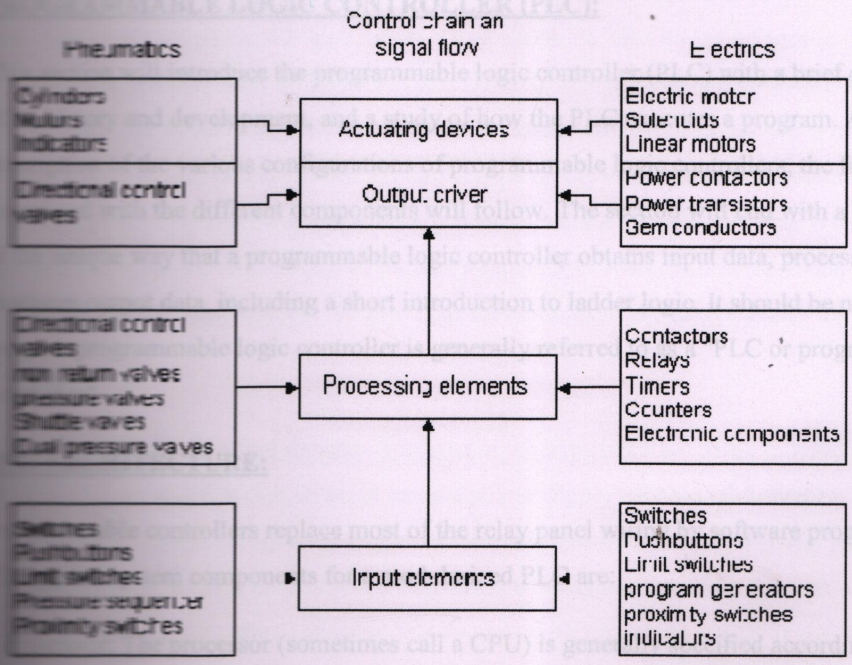


Fig. 2 Difference between pneumatics and electro pneumatics.

ADVANTAGES OF ELECTRO-PNEUMATICS

- Valves can be remotely operated from a distance (Useful in hazardous environments like nuclear facilities, welding, paint booth).

- Air consumption is less compared to pure pneumatics (compressed air is expensive).
- Flexible and easy to modify and change the circuit.
- Signal transmission is very fast.
- Signaling elements are inexpensive.
- Easy to implement complex logic using electrical circuits when compared to basic pneumatics.
- Higher reliability (fewer moving parts subject to wear).
- Lower installation effort.
- Interfacing of electrical device with PLC and other sensors is much easier.

PROGRAMMABLE LOGIC CONTROLLER (PLC):

This section will introduce the programmable logic controller (PLC) with a brief discussion of its history and development, and a study of how the PLC executes a program. A physical description of the various configurations of programmable logic controllers, the functions associated with the different components will follow. The section will end with a discussion of the unique way that a programmable logic controller obtains input data, process it, and produces output data, including a short introduction to ladder logic. It should be noted that in usage, a programmable logic controller is generally referred to as a "PLC or programmable controller"

PLC ARCHITECTURE:

Programmable controllers replace most of the relay panel wiring by software programming. The typical system components for a modularized PLC are:

1. Processor: The processor (sometimes call a CPU) is generally specified according to

2.memory required for the program to be implemented. In the modularized versions,This includes features such as higher math functions, PID control loops and optional programming commands. The processor consists of the microprocessor, system memory, and serial communication ports for printer, PLC LAN link and external programming device and in some cases, the system power supply to power the processor and I/O modules.

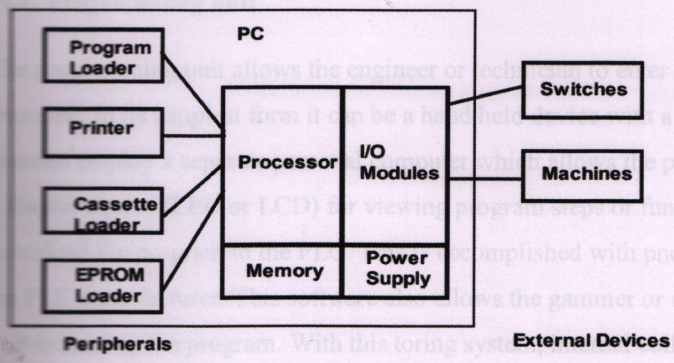


Fig 3: Architecture of PLC

Input and output modules:

Input and output (1/0) modules are specified according to the input and output signals associated with the particular application. These modules fall into the categories of discrele, analog, high speed counter or register types. Discrete I/O modules are generally The module can be specified as AC only, DC only or AC/DC along with the voltage values capable of handling 8 or 16 and in some cases 32, on-off type inputs or outputs per module. for which it is designed. Analog input and output modules are available and are specified Bacording to the desired resolution and voltage or current range. 100% Manufacturers provide analog input and output in the same module. As with discrete modules, these are generally input or output.

Power supply:

The power supply specified depends upon the manufacturer's PLC being utilized in the application. As stated above, in some cases a power supply capable of delivering all quired power for the system is furnished as part of the processor module. If the power supply is a separate module, it must be capable of delivering a current greater than the sum of all the currents needed by the other modules. For systems with the power supply inside CPU module, there may be some modules in the system which require excessive power not available from the processor because of voltage or current requirements that can only be achieved through the addition of a second power source. This is generally true if analog external communication modules are present since these require DC supplies.

PLC Programming unit

The programming unit allows the engineer or technician to enter and edit the ogram to be executed. In its simplest form it can be a hand held device with a keypad for more advanced systems employ a separate personal computer which allows the programmer ogram entry and a display device (LED or LCD) for viewing program steps or functions. write, view, edit and download the program to the PLC. This is accomplished with pnetary software available from the PLC manufacturer. This software also allows the gammer or engineer to monitor the PLC as it is running the program. With this toring system, internal coils, registers, timers and other items not visible externally can monitored to determine proper operation.

This can be advantageous when debugging the program. Communication with the ammable controller with this system is via a cable connected to a special programming Connection to the personal computer can be through a serial port or from a dedicated ad installed in the computer.

Sensors and Actuators

It provides input signals in the form of switches such as push buttons, selector liit switches etc and the output obtained from PLC is given to actuators such as steroids, indicator lamps and relays.

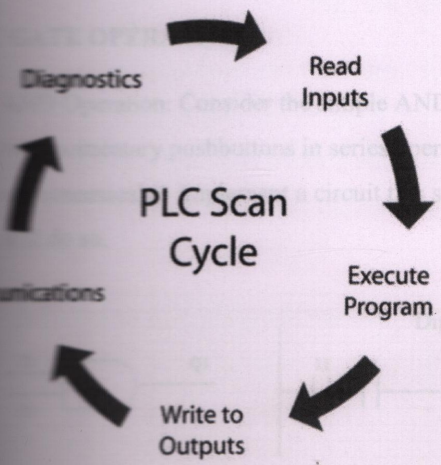


Fig 4. PLC scan cycle

The procedure of I/O update and solving the ladder diagram and VO update is referred to as scanning and is represented in figure 2.12. The period between one I/O update and the next is referred to as one Scan. The amount of time it takes the PLC to get from one 10 update to the next is referred to as Scan Time. Scan time is typically measured in seconds and is related to the speed of the CPU and the length of the ladder diagram that as to be solved. The slower the processor or the longer the ladder diagram, the longer the time of the system. The speed at which a PLC scans memory is referred to as Scan Rate. Scan rate units are usually listed in msec/K of memory being utilized for the program. As an example, if a particular PLC has a rated scan rate of 8 msec/K and the program pics 6K of memory, it will take the PLC 48 msec to complete one scan of the program.

Ladder Diagram

Machine control design is a unique area of engineering that requires the knowledge of certain specific and unique diagramming techniques called ladder diagramming. Fundamental components used in electrical machine control are;

-Control transformer

-Fuses

-Switches

-Indicator lamps

BASIC GATE OPERATION

I. AND Operation: Consider the simple AND circuit shown in Figure 2.13 consisting of two momentary pushbuttons in series operating a lamp. Although it would be very uneconomical to implement a circuit this simple using a PLC, for this example we will do so.

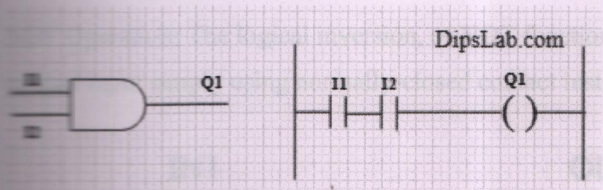


Fig 5: AND Gate in PLC

In this case we need to connect the two switches in series. However, once the signals are inside the PLC, they are assigned new reference designators which are determined by the respective terminal on the PLC. Since switch1 is connected to IN1, it will be called IN1 in our program. Likewise, switch2 will become IN2 in our program. LAMPI is connected to OUTI on the PLC, it will be called relay OUT1 in our program.

2. OR Operation: In this case we need to connect the two switches in series. However, once the signals are inside the PLC, they are assigned new reference designators which are determined by the respective terminal on the PLC. Since switch1 is connected to IN1, it will be called IN1 in our program. Likewise, switch2 will become IN2 in our program. LAMPI is connected to OUTI on the PLC, it will be called relay OUT1 in our program.

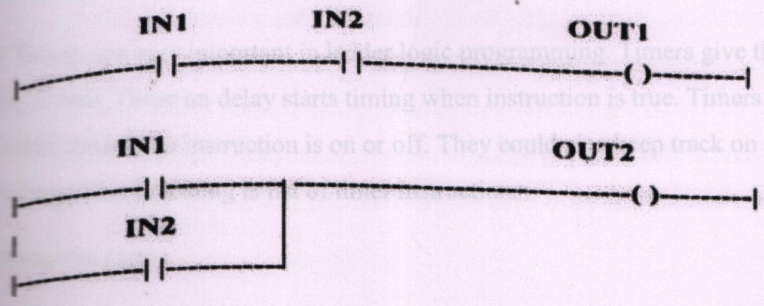


Fig : OR operation of PLC

Ladder diagram with Added OR Rung. Now that we have the inputs and outputs connected, we can write the program. We do this simply adding to the program the additional rung that need perform operation. Keep mind that other than the additional lamp and the time it takes add the additional program, this additional OR feature costs nothing.

3. NOT Operation: The logical inversion, or NOT function can be performed on a contact input simply using normally-closed contact instead of normally-open contact

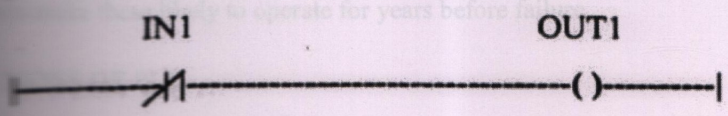


fig: NOT operation in PLC

4. NAND Operation: If we take our OR function and invert each "input" through the use of normally-closed contacts, we will end up with a NAND function. In a special branch of mathematics known & Boolean algebra, this effect of gate function identity changing with the inversion of input gals is described by De Morgan's Theorem.

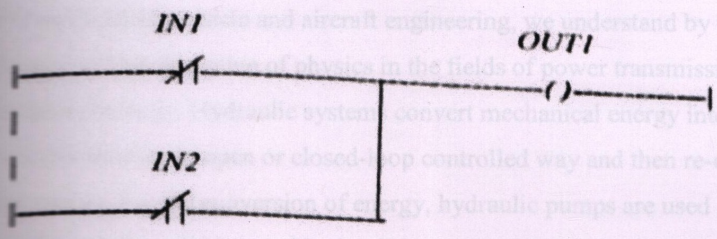


Fig : NAND operation in PLC

The lamp will be energized if either contact is un-actuated. It will go out only if both antacts are actuated simultaneously

5. Timers: Timers are very important in ladder logic programming. Timers give the precision in ame. Timer on delay starts timing when instruction is true. Timers are used to track time when instruction is on or off. They could also keep track on a retentive base. The following is list of timer instructions:

TON- Timer On Delay

TOF-Timer Off Delay

RTO - Retentive Timer

ADVANTAGES OF PLCS:

-Less wiring

-Wiring between devices and relay contacts are done in the PLC program.

-Easier and faster to make changes.

-Trouble shooting aids make programming easier and reduce downtime. Reliable components make these likely to operate for years before failure.

LIMITATIONS OF PLC

-There's difficulty with changes or replacements.

- It's always difficult to find errors and require skilful work force. When a problem occurs, build-up time is indefinite, usually long.

HYDRAULICS: Hydraulics, derived from the Greek word hydro water, refers, in a scientific sense, to Se science of still and moving fluids (hydrostatics and hydrodynamics). If we speak of hydraulics in mechanical, vehicle and aircraft engineering, we understand by this the practical application of this discipline of physics in the fields of power transmission and open and closed control technology. Hydraulic systems convert mechanical energy into hydraulic energy. port it in this form in an open or closed-loop controlled way and then re-convert it into mechanical energy. For the conversion of energy, hydraulic pumps are used on the primary side, and hydraulic cylinders and hydraulic motors on the secondary side. Hydraulic energy and see the transmitted power can be influenced in pressure and flow by hydraulic pumps and in a magnitude and direction of action by open and closed-loop control valves. The hydraulic and that is directed via pipes, hoses and bores in control blocks or manifolds assumes and they transport. For storing and maintaining the hydraulic fluid, additional equipment such as ervoirs, filters, coolers, heaters, measuring and testing instruments are required. mechanical energy into hydraulic energy, transports it in an open or closed-loop controlled As illustrated in the schematic above, an oil-hydraulic system firstly converts ay and then converts it into mechanical work. The components used in hydraulics can be satisified according to their function.

Conversion of Energy in Hydraulics

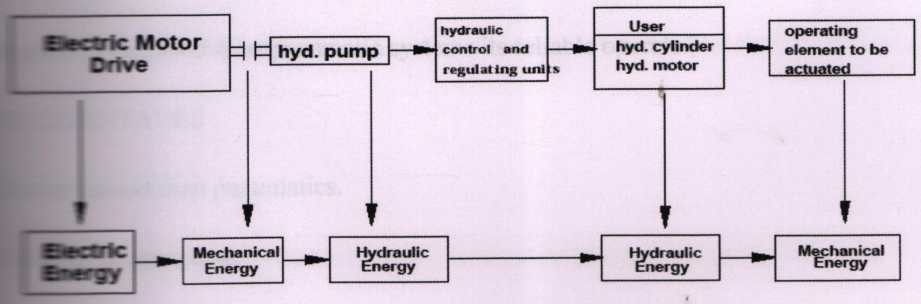
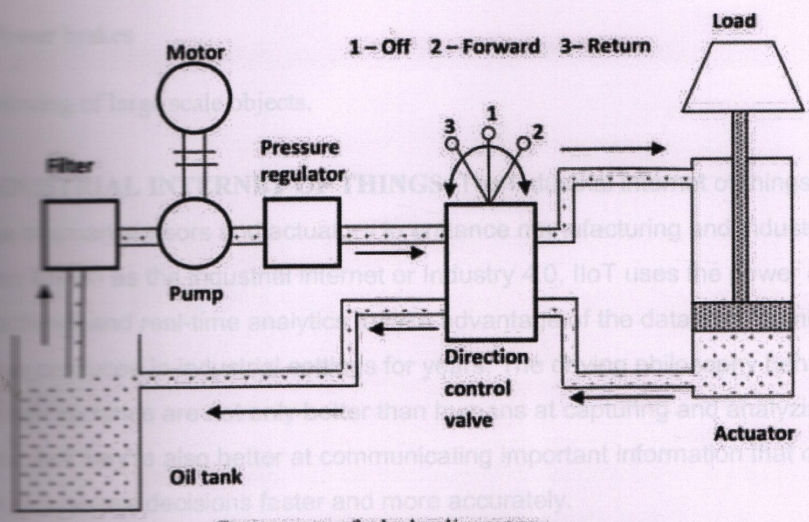


Fig: Energy Conversion



Components of a hydraulic system

Hydraulic cylinder: Hydraulic cylinder is a mechanical component which extends or facts whenever oil (hydraulic energy) is supplied from the hydraulic tank with the help of

hydraulic pump Throttle check valve: The mechanical valve which controls the flow of oil to the cylinder that helps to control the extension speed of the cylinder.

Directional valve: It is used to control the direction of the flow of the oil so that we can make the cylinder to extend or retract.

Hydraulic pump: Hydraulic pump is use to pump the oil from the oil tank.

ADVANTAGE

-It gives more power than pneumatic systems its reliable operate.

DISADVANTAGES

-Slower motion than pneumatics.

-Complex construction.

-Leakage oil problem.

APPLICATIONS

-Power lift

-Crane hoist

- Power brakes

- Moving of large scale objects.

INDUSTRIAL INTERNET OF THINGS: The industrial internet of things (IIoT) is the use of smart sensors and actuators to enhance manufacturing and industrial processes. Also known as the industrial internet or Industry 4.0, IIoT uses the power of smart machines and real-time analytics to take advantage of the data that "dumb machines" have produced in industrial settings for years. The driving philosophy behind IIoT is that smart machines are not only better than humans at capturing and analyzing data in real time, but they're also better at communicating important information that can be used to drive business decisions faster and more accurately.

Connected sensors and actuators enable companies to pick up on inefficiencies and problems sooner and save time and money, while supporting business intelligence efforts. In manufacturing, specifically, IIoT holds great potential for quality control, sustainable and green practices, supply chain traceability, and overall supply chain efficiency. In an industrial setting, IIoT is key to processes such as Predictive maintainance (PdM), enhanced field service, energy management and asset tracking.

How does IIoT work?

IIoT is a network of intelligent devices connected to form systems that monitor, collect, exchange and analyze data. Each industrial IOT ecosystem consists of: connected devices that can sense, communicate and store information about themselves; public and/or private data communications infrastructure; analytics and applications that generate business information from raw data; storage for the data that is generated by the IIoT devices; and people.

Advantages of IoT

- Improved productivity of staff and reduced human labor.

- Efficient operation management.

- Better use of resources and assets.

- Cost-effective operation.

- Improved work safety.

- Thorough marketing and business development.

- Improved customer service and retention.

- Better business opportunities.

Disadvantages of IoT:

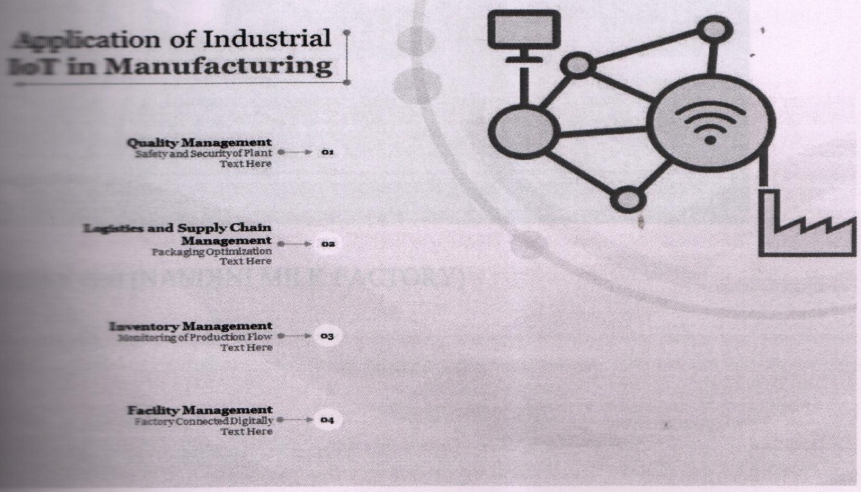
- Security and Privacy. This can be the biggest disadvantage of IoT as people are losing their privacy by adopting and using these smart devices in their lives.

- Increased unemployment.

- Too Much Dependency on Technology

- Lose life control

Application of IIOT:



LIST OF PHOTOGRAPHS:

Industrial visit (VIJAYA KARNATA PRINTING PRESS)

Industrial visit (NANDINI MILK FACTORY)

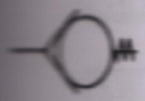
LIST OF SYMBOLS:

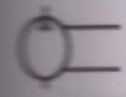
Accumulator

Air Dryer

Air Motor (One Direction Flow)

Air Motor (Two Direction Flow)

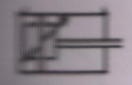

Check Valve (Spring Loaded)

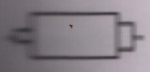

Compressor

Cylinder (Spring Return)

Cylinder Double Acting
(Double Rod)

Cylinder Double Acting
(Single fixed cushion)


Cylinder Double Acting
(Two adjustable cushions)


Differential Pressure

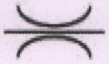
Direction of Flow

Exhaust Line or Control Line

Filter

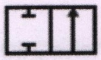
Filter (Automatic Drain)

Filter (Manual Drain)


Fixed Restriction

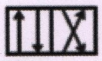
Air Motor (Two Direction Flow)

Lubricator



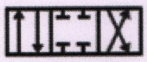
2-position, 2-way, 2 ported

2-position, 3-way, 3 ported

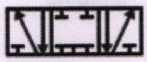


2-position, 4-way, 4 ported

2-position, 4-way, 5 ported



3-position, 4-way, 4 ported Closed Center



3-position, 4-way, 5 ported Closed Center

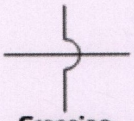
3-position, 4-way, 5 ported Pressure Center

3-position, 4-way, 5 ported Open Center

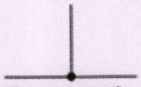
Miscellaneous fluids drawing elements

Piping

Pilot line

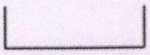


Crossing lines

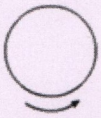


Connected lines

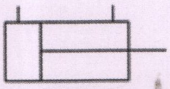
Pump



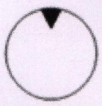
Reservoir



Electric motor



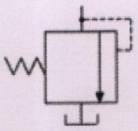
Cylinder



Hydraulic motor

Filter

Accumulator



System relief valve

Oil Cooler

Filter

Breather

Test Point

Check Valve

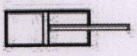
Shutoff Valve

Pump with Motor

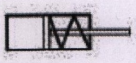
Pump

Fan Drive Motor

Accumulator



Hydraulic Cylinder



Brake Piston

Control Valve

Pressure Switch

Warning Switch

350-1212

B.V.V. Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS)
BAGALKOT-587102

REPORT OF INTERNSHIP (UAU718I)
AT

INTERNSHALA CATIA (ONLINE)

Submitted in partial fulfillment of the Bachelor of Engineering

In

AUTOMOBILE ENGINEERING

[For the Academic Year 2021-22]

By

Mr. VENKATESH L BANDIWADDAR
USN: 2BA19AU409

Guide	Supervisor	Head of the Department
DR S S HIREMATH		DR V G AKKIMARADI

19/12/22

INTERNSHALA TRAININGS

Certificate of Training

Venkatesh L Bandiwaddar

from Basaveshwar Engineering College (Autonomous) Bagalkot has successfully completed a 6-week online training on **CATIA**. The training consisted of Introduction to CATIA and Sketcher Workbench, Part Design Workbench, Wireframe and Surface Design, Assembly Workbench, Drafting Workbench, and Final Training Project modules.

In the final assessment, Venkatesh L scored 53% marks.

We wish Venkatesh L all the best for future endeavours.

Sarvesh Agarwal

FOUNDER & CEO, INTERNSHALA

Date of certification: 2021-09-24 Certificate no. : 3AD95001-E056-3B93-4AE2-CB28C0F00B66

For certificate authentication, please visit https://trainings.internshala.com/verify_certificate

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ACKNOWLEDGEMENT

This Is Internship Report On Catia Is Outcome Of Guidance Moral Support And Devotion Bestowed On Us Throughout Our Work. For This I Acknowledge And Express Our Profound Sense Of Gratitude During The Internship Training Work.

I Express My Warm Thanks To **Mr. S.N.S. Roy** Cto & Chief Content Designer , Esheron Innovooks Pvt. Ltd For Their Guidance At CATIA At Internshala Online Platform.

I Thanks Must To Our Hod Dr.V.G. Akkimaradi, College Guide R A Patil And All Staff, Department Of Automobile Engineering, Bec Bagalkot For Them Constant Support, Valuable Suggestions And Guidance Throughout The Completion Of Our Internship Training.

Most Importantly, I Extremely Grateful To My Parents and My Friends, Whose Support, Encouragement, And Love Have Always Helped Us Sail Through Obstacles.

ABSTRACT

Internshala is an internship and online training platform, based in Gurgaon, India. Founded by Sarvesh Agarwal, an IIT Madras alumnus, in 2011, the website helps students find internships with organizations in India.

Internshala is a technology company on a mission to equip students with relevant skills & practical exposure to help them get the best possible start to their careers.

CATIA is the world's leading solution for product design and experience that is used in a wide range of industries like aerospace, automotive, architecture, defence, and more.

INTRODUCTION OF INTERNSHALA

Internshala is an internship and online training platform, based in Gurgaon, India. Founded by Sarvesh Agrawal, an IIT Madras alumnus, in 2011, the website helps students find internships with organizations in India.

Internshala is a technology company on a mission to equip students with relevant skills & practical exposure to help them get the best possible start to their careers.

Imagine a world full of freedom and possibilities. A world where you can discover your passion and turn it into your career. A world where you graduate fully assured, confident, and prepared to stake a claim on your place in the world.

Details about the internship:-

"This internship report reflects the 6 week's training at INTERNSHALA Online platform, The report has details of the practical experience and the academic knowledge that I have gained from Internshala during these 6 week's as a student and it is included of the details that I have conducted and involved. I have made this report on python. I have tried my best to elucidate all the relevant details to be included in the report. While in the beginning I have tried to give a general view about this language."

Outcome's Of The Internship:-

CONTENTS

- INTRODUCTION
  1. Introduction to CATIA
  2. History
  3. Industry using CATIA
- SOLID MODELLING
  1. Sketcher Workbench
  2. Part Design Workbench
  3. Wireframe and Surface Design
  4. Assembly Workbench
  5. Drafting Workbench
  6. Final Training Project

INTODUCTION

Introduction to CATIA V5R20

CATIA (Computer Aided Three-dimensional Interactive Application) is a multi-platform CAD/CAM/CAE commercial software suite developed by the French company Dassault Systems and marketed worldwide by IBM. Written in the C++programming language, CATIA is the cornerstone of the Dassault Systems product lifecycle management software suite. Through its exceptionally easy –to- use state of the art user interface, CATIA delivers innovative technologies for maximum productivity and creativity, from concept to the final product. CATIA reduces yhe learning curve, as it allows the flexibility of using feature-based and parametric designs. CATIA provides three basic platforms: P1, P2, P3. P1 is for small and medium sized process oriented companies that wish to grow the large scale digitized product definition. P2 is for advanced design engineering companies that require product, process and resources modeling.P3 is for high end design application and it is basically for Automotive and Aerospace industry, where high quality surfacing or Class-A surfacing is used for designing.

History :

CATIA started as an in-house development in 1977 by French aircraft manufacturer Avions Marcel Dassault, at that time customer of the CADAMCAD software. Initially named CATI (Conception Assistée Tri dimensionnelle Interactive — French for Interactive Aided Three-dimensional Design) — it was renamed CATIA in 1981, when Dassault created a subsidiary to develop and sell the software, and signed a non-exclusive distribution agreement with IBM.[2]In 1984, the Boeing Company chose CATIA as its main 3D CAD tool, becoming its largest customer.

In 1988, CATIA version 3 was ported from mainframe computers to UNIX. In 1990, General Dynamics Electric Boat Corp chose CATIA as its main 3D CAD tool, to design the U.S. Navy's Virginia class sub marine. In 1992, CADAM was purchased from IBM and the next year CATIA CADAM V4 was published. In 1996, it was ported from one to four Unix operating systems, including IBMAIX, Silicon Graphics IRIX, Sun Micro systems SunOS and Hewlett-Packard-UX .In 1998, an entirely rewritten version of CATIA, CATIA V5 was released, with support for UNIX, Windows NT and Windows XP since 2001.In 2008, Dassault announced and released CATIA V6. While the server can run on Microsoft Windows, Linux or AIX, client support for any operating system other than Microsoft Windows is dropped.

Industries using CATIA

It is widely used throughout the engineering industry, especially in the automotive and aerospace sectors. Aerospace The Boeing Company used CATIA V3 to develop its 777 airliner, and is currently using CATIA V5 for the 787 series aircraft. They have employed the full range of Dassault Systems' 3D PLM products — CATIA, DELMIA, and ENOVIA LCA — supplemented by Boeing developed applications. Chinese Xian JH-7A is the first aircraft developed by CATIA V5, when the design was completed on September 26, 2000.European aerospace giant Airbus has been using CATIA since 2001. Canadian aircraft maker Bombardier Aerospace has done all of its aircraft design on CATIA. The Brazilian aircraft company, EMBRAER, use CATIA V4 and V5 to build all airplanes. Vought Aircraft Industries use CATIA V4 and V5 to produce its parts.

Automotive

Many automotive companies use CATIA to varying degrees, including BMW, Porsche, Daimler AG, Chrysler, Audi, Volkswagen, Bentley Motors Limited, Volvo, Fiat, Benteler AG, PSA Peugeot Citroën, Renault, Toyota, Ford, Scania, Hyundai, Skoda Auto, Tesla Motors, Proton, Tata motors and Mahindra & Mahindra Limited. Goodyear uses it in making tires for automotive and aerospace and also uses a customized CATIA for its design and development. Many automotive companies use CATIA for car structures — door beams, IP supports, bumper beams, roof rails, side rails, body components — because CATIA is very good in surface creation and Computer representation of surfaces.

Why Learn CATIA?

Popularity

CATIA is the world's leading solution for product design and experience that is used in a wide range of industries like aerospace, automotive, architecture, defence, and more.

Comprehensive

CATIA supports multiple stages of product development - conceptualization, design, engineering, manufacturing, and more all in one.

Competitive edge

With top MNCs like Airbus, Boeing, and BMW using CATIA for their product design requirements, those who know this tool have an upper hand in the job market!

Placement Assistance

Free Placement Prep Training

Learn how to build your resume, make great applications, and ace your interviews.

Curated internships & jobs

Get internships and fresher jobs as per your preference in your inbox.

Get highlighted on Internshala

Top performers will be highlighted in their internship & job applications on Internshala.

THE SKETCHER WORKBENCH

The Sketcher workbench is a set of tools that helps you create and constrain 2D geometries. Features (pads, pockets, shafts, etc...) may then be created solids or modifications to solids using these 2D profiles. You can access the Sketcher workbench in various ways. Two simple ways are by using the top pull down menu (Start – Mechanical Design – Sketcher), or by selecting the Sketcher icon. When you enter the sketcher, CATIA requires that you choose a plane to sketch on. You can choose this plane either before or after you select the Sketcher icon. To exit the sketcher, select the Exit Workbench icon.

The Sketcher workbench contains the following standard workbench specific toolbars

• **Profile toolbar**: The commands located in this toolbar allow you to create simple geometries (rectangle, circle, line, etc...) and more complex geometries (profile, spline, etc...).

• **Operation toolbar**: Once a profile has been created, it can be modified using commands such as trim, mirror, chamfer, and other commands located in the Operation toolbar.

• **Constraint toolbar**: Profiles may be constrained with dimensional (distances, angles, etc...) or geometrical (tangent, parallel, etc...) constraints using the commands located in the Constraint toolbar.

• **Sketch tools toolbar**: The commands in this toolbar allow you to work in different modes which make sketching easier.

• **User Selection Filter toolbar**: Allows you to activate different selection filters

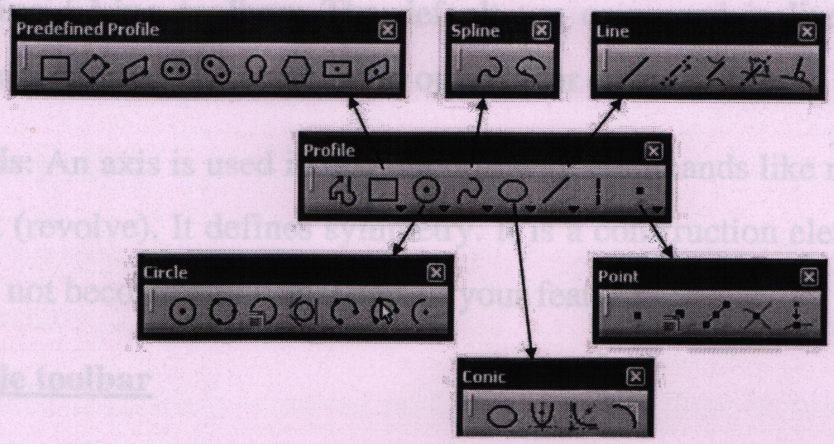
• **Visualization toolbar**: Allows you to, among other things to cut the part by the sketch plane and choose lighting effects and other factors that influence how the part is visualized.

• **Tools toolbar**: Allows you to, among others other things, to analyze a sketch for problems, and create a datum.

Simple Profiles & Constraints

Profile toolbar

The Profile toolbar contains 2D geometry commands. These geometries range from the very simple (point, rectangle, etc...) to the very complex (spli nes, conics, etc...). The Profile toolbar contains many sub-toolbars. Most of these subtoolbars contain different options for creating the same geometry. For example, you can create a simple line, a line defined by two tangent points, or a line that is perpendicular to a surface. Reading from left to right, the Profile toolbar contain the following commands.



• **Profile**: This command allows you to create a continuous set of lines and arcs connected together.

• **Rectangle / Predefined Profile toolbar**: The default top command is rectangle. Stacked underneath are several different commands used to create predefined geometries.

• **Circle / Circle toolbar**: The default top command is circle. Stacked underneath are several different options for creating circles and arcs.

• **Spline / Spline toolbar**: The default top command is spline which is a curved line created by connecting a series of points.

• **Ellipse / Conic toolbar**: The default top command is ellipse. Stacked underneath are commands to create different conic shapes such as a hyperbola.

• **Line / Line toolbar**: The default top command is line. Stacked underneath are several different options for creating lines.

• **Axis**: An axis is used in conjunction with commands like mirror and shaft (revolve). It defines symmetry. It is a construction element so it does not become a physical part of your feature

Circle toolbar

The Circle toolbar contains several different ways of creating circles and arcs. Reading from left to right, the Circle toolbar contains the following commands.

• **Circle**: A circle is defined by a center point and a radius.

• **Three Point Circle**: The three point circle command allows you to create a circle using three circumferential points.

• **Circle Using Coordinates**: The circle using coordinates command allows you to create a circle by entering the coordinates for the center point and radius in a Circle Definition window.

• **Tri-Tangent Circle**: The tri-tangent circle command allows you to create a circle whose circumference is tangent to three chosen lines.

• **Three Point Arc**: The three point arc command allows you to create an arc defined by three circumferential points.

• **Three Point Arc Starting With Limits**: The three point arc starting with limits allows you to create an arc using a start, end, and midpoint.

• **Arc**: The arc command allows you to create an arc defined by a center point, and a circumferential start and end point

Spline toolbar

Reading from left to right, the Spline toolbar contains the following commands.

• **Spline**: A spline is a curved profile defined by three or more points. The tangency and curvature radius at each point may be specified.

• **Connect**: The connect command connects two points or profiles with a spline.

Conic toolbar

Reading from left to right, the Conic toolbar contains the following commands.

• **Ellipse**: The ellipse is defined by center point and a major and minor axis points.

• **Parabola by Focus**: The parabola is defined by a focus, apex and a start and end point.

• **Hyperbola by Focus**: The hyperbola is defined by a focus, center point, apex and a start and end point.

• **Conic**: There are several different methods that can be used to create conic curves. These methods give you a lot of flexibility when creating above three types of curves.

Line toolbar

The Line toolbar contains several different ways of creating lines. Reading from left to right, the Line toolbar contains the following commands.

- **Line**: A line is defined by two points.
- **Infinite Line**: Creates infinite lines that are horizontal, vertical or defined by two points.
- **Bi-Tangent Line**: Creates a line whose endpoints are tangent to two other elements.
- **Bisecting Line**: Creates an infinite line that bisects the angle created by two other lines.
- **Line Normal to Curve**: This command allows you to create a line that starts anywhere and ends normal or perpendicular to another element.

Point toolbar

The Point toolbar contains several different ways of creating points. Reading from left to right, the Point toolbar contains the following commands.

- **Point by Clicking**: Creates a point by clicking the left mouse button.
- **Point by using Coordinates**: Creates a point at a specified coordinate point.
- **Equidistant Points: Creates equidistant** points along a predefined path curve.

• **Intersection Point: Creates** a point at the intersection of two different elements.

• **Projection Point**: Projects a point of one element onto another.

Constraint toolbar

Constraints can either be dimensional or geometrical. Dimensional constraints are used to constrain the length of an element, the radius or diameter of an arc or circle, and the distance or angle between elements. Geometrical constraints are used to constrain the orientation of one element relative to another. For example, two elements may be constrained to be perpendicular to each other. Other common geometrical constraints include parallel, tangent, coincident, concentric, etc... Reading from left to right:

• **Constraints Defined in Dialoged Box**: Creates geometrical and dimensional constraints between two elements. • Constraint: Creates dimensional constraints.

• **Contact Constraint**: Creates a contact constraint between two elements.

• **Fix Together**: The fix together command groups individual entities together.

• **Auto Constraint**: Automatically creates dimensional constraints.

• **Animate Constraint**: Animates a dimensional constraint between to limits.

• **Edit Multi-Constraint**: This command allows you to edit all your sketch constraints in a single window.

Selecting icons When an icon is selected, it turns orange indicating that it is active. If the icon is activated with a single mouse click, the icon will turn back to blue (deactivated) when the operation is complete. If the icon is activated with a double mouse click, it will remain active until another command is chosen or if the Esc key is hit twice.

PART MODELEILING

The part modeled in this tutorial is shown on the right. This part will be created using simple profiles, circles, arcs, lines, and hexagons. The geometries are constrained to conform to certain dimensional (lengths) and geometrical constraints (tangent, perpendicular, etc...)

1) Launch CATIA V5, enter the Part Design workbench and, if asked, name your part Post.

2) Enter the Sketcher on the zx plane.

3) Set your grid spacing to be 100 mm with 10 graduations, activate the Snap to point, and activate the geometrical and dimensional constraints. (Tools – Options...)

Design: With this module surfaces can be drawing with zero size and weight and has its uses in the aerospace, automotive, ships and Mold Design.

- Toolbars in Wire-Frame and Surface Design
- Surface Toolbar
- Operation Toolbar Wire-Frame Toolbar

Wire frame and Design Surface Workbench:

The Wireframe and Surface Design workbench provides the tools to create wireframe construction elements during preliminary design and enrich existing 3D mechanical part design with wireframe and basic surface features.

Starting Wireframe and Surface Design Workbench Start a new session of CATIA and close the new product file, which is opened by defaul. Next, choose Start > Mechanical Design > Wireframe and Surface Design from the menu bar to start a new file in the Wireframe and Surface Design Workbench

Creating Wireframe Elements:

Creating Circles

Creating Splines

Creating helix

Creating extruded surface

Creating revolved surface

Creating spherical surface

Creating cylindrical surface

Creating offset surface

Creating swept surface

Creating fill surface

Creating blended surface

OPERATION TOOLS

ASSEMBLY DESIGN.

This module is responsible for assembling the parts previously produced in Part Design, and it is most important for those who work in the field of machinery design or design in general, because it is the one who shows the inter-relationships between the parts of the machine or any mechanical establishment. Assembly modelling is the process of creating designs that consist of two or more components assembled together at their respective work positions. The components are brought together and assembled in Assembly Design workbench by applying suitable parametric assembly Constraints to them

Types of Assembly Design Approach:

In CATIA you can create assembly models by adopting two types of approaches. The first design approach is the bottom-up approach and the second one is the top-down approach. Both these design approaches are discussed below. 6.2.1 Bottom-up Assembly:

The bottom-up assembly is the most preferred approach for creating assembly models. In this of approach, the components are created in the Part Design workbench file. Then the product file is started and all the previously created components are inserted and placed in it using the took provided in the Assembly Design workbench. After inserting each component, constraints are applied to position them properly in the 3D space with respect to other components.

Top-down Assembly:

in the top-down assembly design approach components are created inside the Assembly Design workbench. Therefore, there is no need to create separate part files

of the components. This design approach is completely different from the bottom-up design approach. Here you have to start the product file first and then, one by one, create all components. Note that even though the components are created inside the product file, they are saved as individual part files and can be opened separately later. 63 Product Structure Tools Toolbar:

This first task shows how to insert new component, new part and existing component

Inserting a new component

This task will show you how to insert a component into an existing assembly. This command lets you: create an instance from the reference chosen component use an context-specific representation inside it.

Inserting a New Part:

This task will show you how to insert a part in an existing assembly.

1. In the specification tree, select ManagingComponents01 and click the New Part icon. If geometry exists in the assembly, the New Part: Origin Point dialog box is displayed, proposing two onions to locate the part:

Inserting Existing Components:

This task will show you how to import one or more components into an existing assembly You can specity the order in which the files will be imported when youselect the files in the Insert an Existing Component diabg box.

Replacing a Component:

This task consists in replacing a component Using the Replacement Component command means replacing one component with another

Construint toolbar:

Constraints can either be dimensional or geometrical. Dimensional constraints are used to constrain the length of an element, the radius or diameter of an are or circle, and the distance or angle between elements Geometrical constraints are used to constrain the orientation of one element relative to another. Other common geometrical constraints include parallel tangens, coincident, concentric, etc... Reading from left to right:

Creating a Coincidence Constraint:

Coincidence type constraints are used to align elements. Depending on the selected elements, you may obtain concentricity, coaxiality of coplanarty. This task consists in applying a constraint between two faces

Creating a Contact Constraint: Contact type constraints can be created between two plines or faces. The common area between the two planes can be a plane (pline contact), a line (line contact) or a point(point contact)

Creating an Angle Constraint:

Angle type constraints fall into three categories:

1. Angle, 2. Parallelism (angle vahe equals zero).

3. Perpendicularity (angle vabe equals 90")

When setting an angle constraint, you will have to define an angle value. Note that this angle value must not exceed 900.The tolerance ie, the smallest angle that can be used to differentiate two elements is set at 10-6 radians.

Fixing a Component:

Fruing a component means preventing this component from moving from its parent component during the update operation. Note that it does not mean fixing its position according to the geometrical origin of the assembly. To fix the component location according to the

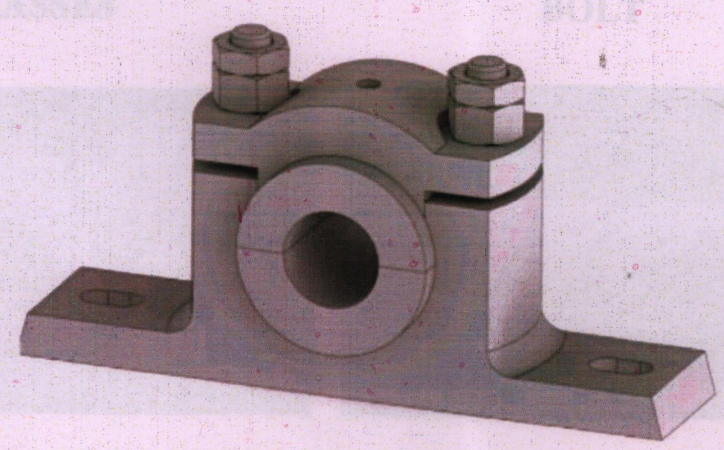
geometrical origin of the assembly, check Fix in space in the constraint Properties dialog box.

Fixing Components Together:

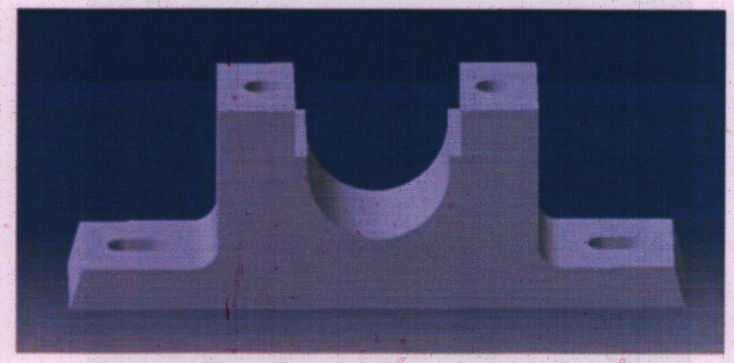
The Fix Together command taches selected elements together. You can select as many components as you wish, but they must belong to the active component This task consists in frung two components together Using the Auto constraint Command

The Auto contrat de allows you to create the first possible contrare as specifiedin the prorry last The task coma n ung the Auso contrart command to create two constraints

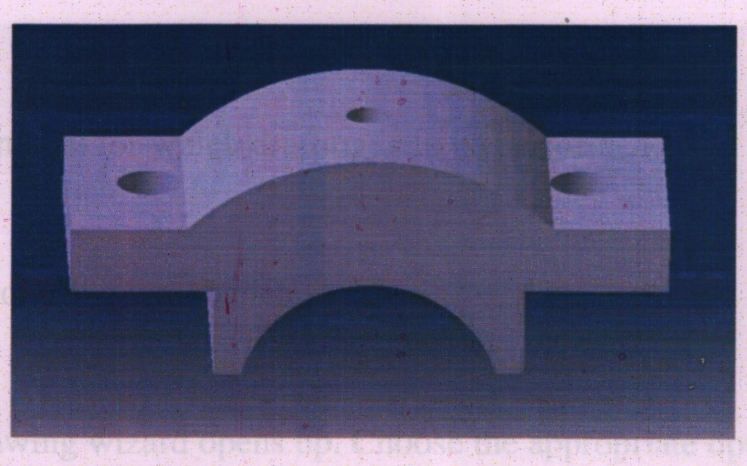
PLUMMER BLOCK



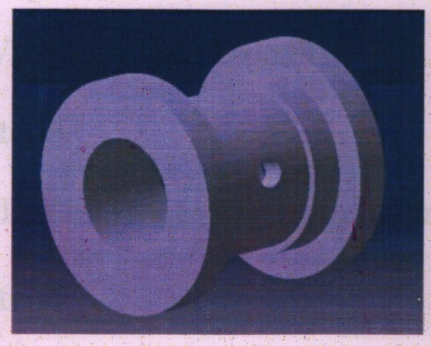
BODY OF PLUMMER BLOCK



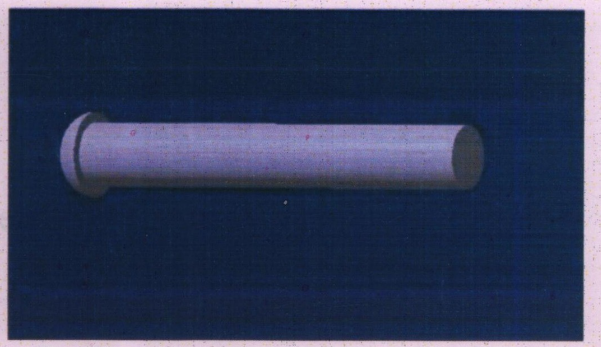
CAP OF PLUMMER BLOCK



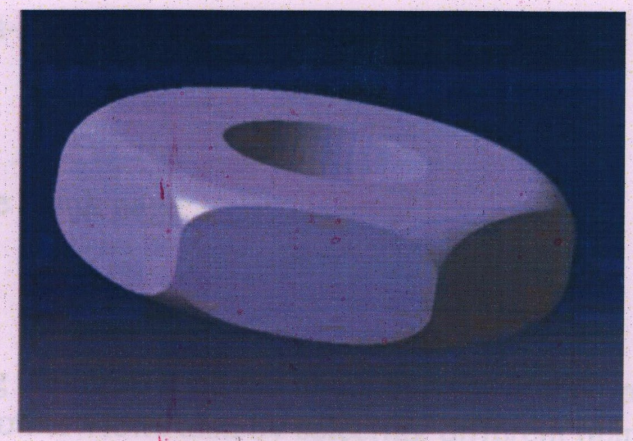
BRASSES



BOLT



LOCKNUT



Drafting Workbench

Step 1

Open the model for which drafting is to be performed.

Step 2

Switch to drafting workbench

Step 3

A new drawing wizard opens up. Choose the appropriate option. Here i chose a blank page.

Step 4

Window->tile vertically

Step5

Click on front view from the menu

Step6

Or get it from

Insert->views->projection->front view

Step7

Place it on the blank page.

Step8

Similarly drag and drop it on the blank page as in the previous case.
Similarly get other views also by selecting different planes.

Step9

Right click on the drawing-> properties

Step10

Select the options as per requirement-> click OK

Step11

Edit->sheet background

Step12

Insert-> Drawing-> Frame and title block

Step13

Choose the title block->apply->ok

Step14

Insert->geometry modification->transformation->scale

Step15

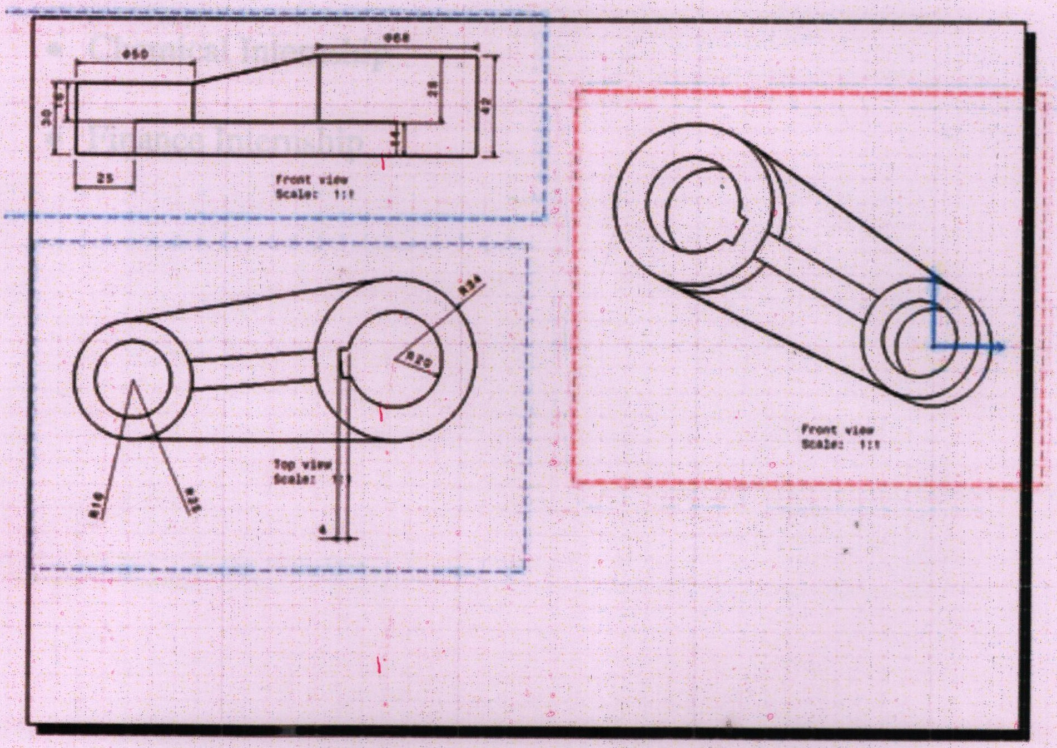
Uncheck duplicate mode- Select value->ok

Step16

Edit->working views

Step17

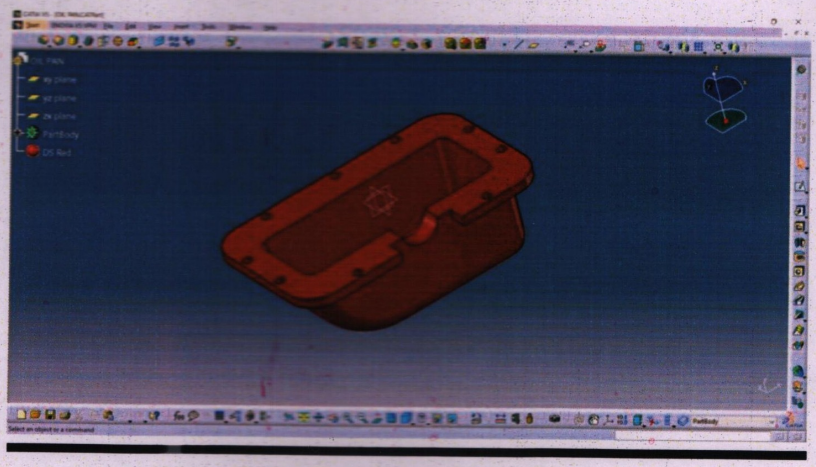
Save as->*.catdrawing

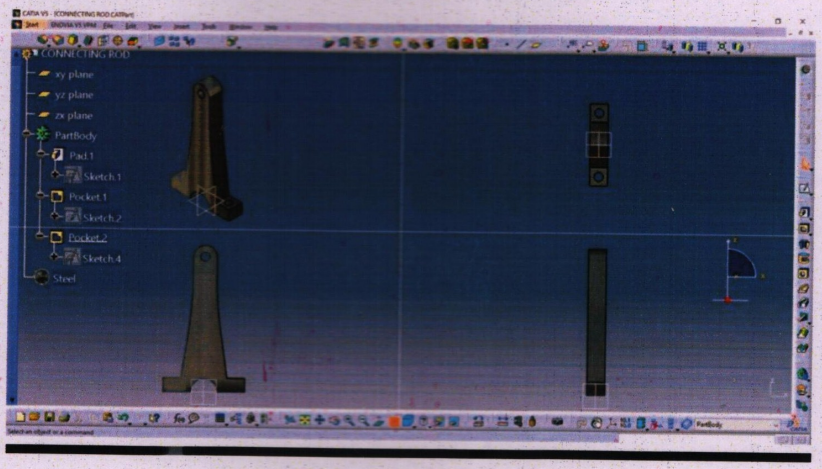


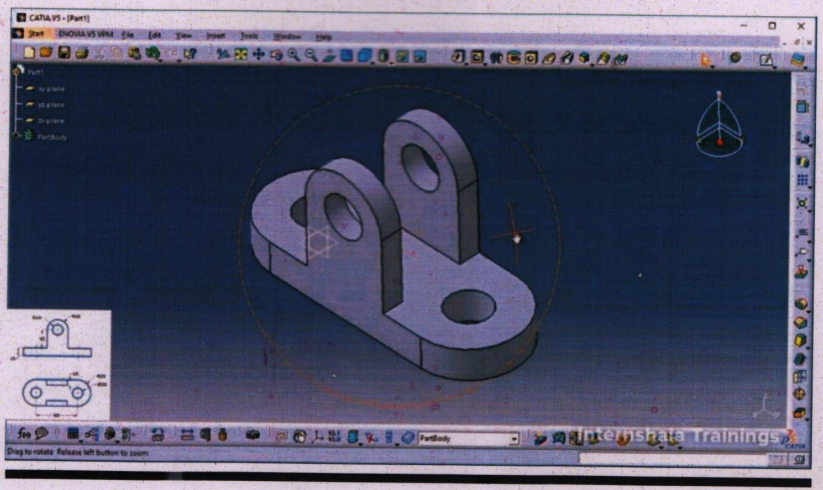
INTERNSHIP BY STREAM(*Departments*)

- Mechanical Internship
- Computer science Internship
- Electronics Internship
- Civil Internship
- Chemical Internship
- Finance Internship

LIST OF PHOTOGRAPHS







B.V.V. Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS)
BAGALKOT-587102

REPORT OF INTERNSHIP (UAU718I)
AT

VTU National Academy For Skill Development Training Center, Dandeli

Submitted in partial fulfillment of the Bachelor of Engineering

In

AUTOMOBILE ENGINEERING

[For the Academic Year 2021-22]

By

Mr. Gurunath K Ghorpade
USN: 2BA18AU007

Guide	Supervisor	Head of the Department
Dr.V.G.Akkimardi		Dr.V.G.Akkimardi

VTU-NASD/INTERNSHIP/07/CNCINT2162B11

Visvesvaraya Technological University

National Academy for Skill Development

Internship Completion Certificate

This Certificate has been issued to

Mr. / Ms. GURUNATH KASHINATH GHORPADE for a successful completion of Online Internship on

CNC Operations and Programming with "SATISFACTORY" performance Conducted for the Duration of 4 Weeks

from 23 August 2021 to 17 September 2021 organized by

VTU-National Academy for Skill Development, Dandeli-581325.

Balavant k. Patil
CTO, VTU-NASD

Prof. Vishal Kulkarni
Director, VTU-NASD

Dr. A. S. Deshpande
Registrar, VTU

"Score card is attached along with this certificate and final grading is based on score card marks"

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ACKNOWLEDGEMENT

It gives me immense pleasure to express my deepest sense of gratitude and sincere thanks to our highly respected and esteemed guide Prof.V G Akkimardi for their valuable guidance, encouragement and help for completing this work. Their useful suggestions for this whole work and co-operative behaviour are sincerely acknowledged.

We wish to express our deep gratitude to our internship supervisior H L Nadaf & Head of the department Dr. V G Akkimardi , of Automobile Engineering department, Basaveshwar Engineering College for their extreme valuable guidance and hearted co-operation throughout the internship their constant encouragement and advice gave us the inspiration for the complication of this dissertation.

It gave us the immense pleasure to express our sincere gratitude to Dr.S.S,Injaganeri Principal for his inspiring advice, motivation, constant support, encouragement, guidance and help during our course of study and internship work.

Finally, our sincere thanks to all the stuff members of department of Automobile Engineering, Basaveshwar Engineering college, Bagalkot and all our friends, who contributed directly and indirectly to make this internship successful.

ABSTRACT

The ideal aim in industry is high-speed quantitative production at low costs with the tremendous advances in electronic equipment, mechanics became associated with electronic science. Automatic control is possible in different production areas. With the increase of more complex products, CNC machine was invented. The CNC machine was invented and a new industrial renaissance took place after this invention. Today, most of the factories work according to this technique. One of the reasons for today's development is computer numerical control.

INTRODUCTION OF WORKSHOPS

VTU- National Academy for Skill Development is a noble initiative of Visvesveraya Technological University to cater the present need of skill requirement in India. India today is in a serious need of skilled workforce.

In order to position India in global ranking it is very much required to produce skilled and job ready employee. The Prime Minister of India dream and urged of making India as a skilled nation. And various holistic steps and action has been initiated. Responding to the call of Skill India initiative the VTU-NASD has been established in Dandeli District of Karnataka.

Spread in 26 acres of landscape with advance infrastructure of global standards, the skill development centre aims at introducing certain valuable training courses and programmes to enhance the employability and bridge the gap between academics and Industry. VTU-NASD aims to provide training courses to the needy youths of Karnataka and India in whole, in the lines of National Skill Development Corporation.The primary mission of the academy is to conduct a broad based multidisciplinary programme in various Industrial Technical Fields, directed towards the development of skills and trades and to become a world class training centre that represents

specialized trade training programs in alignment with the Industry requirements across the globe.

VTU-NASD has been supported by the Government of Karnataka. The course and curriculum has been designed with the consultation of industry experts. The support driven from industry is unparalleled. The centre has a team of well qualified and dedicated trainer. All programs/courses follow training standards that are demand oriented and directly imply a close relationship with industry.The advantage of the VTU-NASD is in assisting jobs in the respected domain to industries after the completion of course.

OUTCOMES OF THE INTERNSHIP:

- Histroy
- Introduction to CNC
  - CNC introduction
  - Types of CNC Machines
  - Elements of CNC Machine
  - Block diagram of CNC
  - How CNC works
    - Programming Key letter
    - G code
    - M code
  - Advantages
  - Disadvantages

HISTORY:

- 1955-US air force defined and developed a machine tool capable of machining complex and closed tolerance air craft parts
- 1956-MIT is the contractor and build machine for project. MIT announces Automatic Program Tool (APT) programming language
- 1960- Direct Numerical Control (DNC) this eliminates punch tapes and allows programmers send files directly to machine tool
- 1980-CNC machine introduced to Unix and PC based system.
- 1997-PC windows operating system is attached to CNC

INTRODUCTION:

Before birth of NC machine the conventional machines were controlled by an person ,carriage was moved horizontally and vertically to cut work piece and get required cut .But NC machine were partially controlled by humans through punched tapes (it is rectangular block on which alpha numeric are written say G code and M code)

But NC machine are not used nowadays because codes cannot be modified again on this ,new block needs to be inserted ,were time and material is wasted.

Then came CNC machine, this machine also consists of NC but is integrated with computer. Whatever we need to machine is written in a computer software which is sent to an NC machine and machining process is done. This is when punched tapes were eliminated.

CNC machine also shows us an animation of how the machining is done.

DNC(Direct Numerical Control),in CNC one computer is used and one worker is used to feed the program and supervise it, and perform the machining operation. But the latest machine DNC we have so many CNC machine which is controlled by DNC by wire. More than

two CNC machines can be controlled by an DNC.DCN is the main computer and CNC's are mini computers.

TYPES OF CNC MACHINES:

- Turning center
- Milling center
- Vertical machining center
- Horizontal machining center
- Drilling machine
- EDM machine
- Laser cutting machine

ELEMENTS OF CNC MACHINE:

A CNC machine consists of 6 major elements:

I. Input device

II. Machine control unit

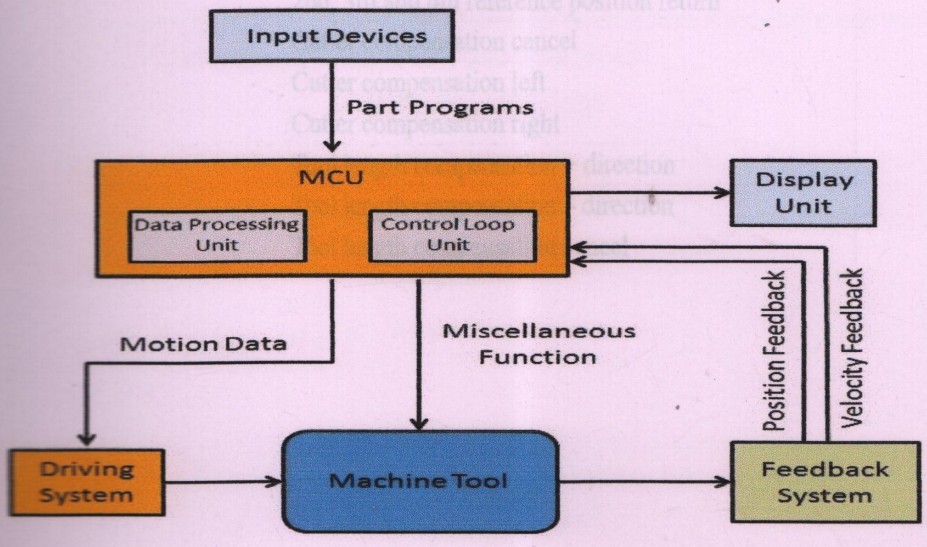
III. Machine tool

IV. Driving system

V. Feedback devices

VI. Display unit

BLOCK DIAGRAM OF CNC MACHINE:



HOW CNC WORKS ?

- Controlled by G ,M codes and programming key letters.
- These are number values and co-ordinates.
- Each number are coded is assigned to a particular operation.
- G and M codes are automatically generated by the computer softer

G code	Description
G03	Circular interpolation CCW
G04	Dwell
G17	X Y plane selection
G18	Z X plane selection
G19	Y Z plane selection
G28	Return to reference position
G30	2nd, 3rd and 4th reference position return
G40	Cutter compensation cancel
G41	Cutter compensation left
G42	Cutter compensation right
G43	Tool length compensation + direction
G44	Tool length compensation – direction
G49	Tool length compensation cancel

G53	Machine coordinate system selection
G54	Workpiece coordinate system 1 selection
G55	Workpiece coordinate system 2 selection
G56	Workpiece coordinate system 3 selection
G57	Workpiece coordinate system 4 selection
G58	Workpiece coordinate system 5 selection
G59	Workpiece coordinate system 6 selection
G68	Coordinate rotation
G69	Coordinate rotation cancel
G73	Peck drilling cycle
G74	Left-spiral cutting circle
G76	Fine boring cycle
G80	Canned cycle cancel
G81	Drilling cycle, spot boring cycle
G82	Drilling cycle or counter boring cycle
G83	Peck drilling cycle
G84	Tapping cycle
G85	Boring cycle
G86	Boring cycle
G87	Back boring cycle
G88	Boring cycle
G89	Boring cycle
G90	Absolute command
G91	Increment command
G92	Setting for work coordinate system or clamp at maximum spindle speed
G98	Return to initial point in canned cycle
G99	Return to R point in canned cycle

ADVANTAGES:

- Easier to program.
- Easy storage of existing programs.
- Easy to change a program.
- Avoids human errors.
- CNC machines are safe to operate.
- Complex geometry is produced as cheaply as simple ones.
- Usually generates closer tolerance than manual machines.

DISADVANTAGES:

- Costly setup, skilled operators required.
- Computer ,programming knowledge required.
- Maintenance is difficult.

OUTCOMES:

- To expose our self to a particular job and a profession or industry.
- To put what we are learning into action, in a real world environment.
- It help us to develop understanding of the world of work and an awareness of our skills and abilities
- To gain industrial experience.

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT

07/10

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

INTERNSHIP REPORT ON

BUSINESS COMMUNICATION SKILLS

NAME : SAVITA PATRAD
USN : 2BA18EI024
COMPANY : INTERNSHALA

CO-ORDINATOR

DR.MANJULA SUTGUNDAR

HEAD OF THE DEPARTMENT

DR.K.BHAT

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INTERNSHALA TRAININGS

Certificate of Training

Savita S Patrad

from Basaveshwar Engineering College Bagalkot, has successfully completed a 4-week online training on **Business Communication Skills**. The training consisted of Introduction to Business Communication, Essential Communication Skills, The Application Process and Workplace Communication Skills modules.

We wish Savita all the best for the future endeavours.

Sarvesh Agarwal

FOUNDER & CEO, INTERNSHALA

Date of certification: 2021-09-16 Certificate no.: 4EE35A85-A305-F5B3-A96B-53483A2D9IC

For certificate authentication, please visit https://trainings.internshala.com/verify_certificate

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TABLE OF CONTENTS

- About the Internship:
- About the company
- About internship
- Duration of internship
- Modules covered in internship
- Experience during internship
- Outcomes
- Conclusion

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ABOUT THE COMPANY

Internshala is an internship and online training platform, based in Gurgaon, India. Founded by Sarvesh Agrawal, an IIT Madras alumnus, in 2011, the website helps students find internships with organisations in India.

Startup Name	Internshala
Headquarter	Gurgaon, India
Sector	Education
Founders	Sarvesh Agrawal
Founded	2010
Area Served	India
Parent Organization	Internshala
Website	internshala.com

Internshala was launched as a WordPress blog initially. The blog dealt with education, technology, and issues about gaps in skills. It was then transformed into an internship portal. It is a free portal for both interns as well as employers. Currently, Internshala has more than 3000000 student visits and 80000+ companies registered on its website. Internshala also offers online educational training in various streams.

The courses on offer are on a chargeable basis but can be downloaded along with the supporting materials such as videos for offline reference. Internshala's courses are largely divided into Summer Training and Winter Training. Internshala offers different kinds of internships—full time, part-time, and work from home. One can find both paid and unpaid internships on Internshala.

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ABOUT THE INTERNSHIP

- Business Communication Skills is one of the internship offered by the most prominent platform on internshala.
- This internship comes under the career development program.
- This internship has different modules assigned with various exercises to improve our skills.
- This training was well conceptualised and every single short video content was illustrative and informative.

DURATION OF THE INTERNSHIP

- Business Communication Skills is one of the career based internship where you can easily communicate each other.
- This internship was for 4 weeks.
- There are 4 Modules, each week contain unique videos and quizzes.
- To get into next module we need to clear the previous module test.

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MODULES COVERED IN INTERNSHIP

This 4-week training covers all the essential communication aspects needed at the workplace.

There are 4 modules

1) Introduction to Business Communication:

- Role and Importance of Communication
- The Communication Process
- Modes of Communication
- Business Communication Skills

2) Essential Communication Skills:

- Effective Communication Techniques
- Introduction to verbal Communication
- Fluency,Enunciation,Pronunciation
- The Art of Questioning
- The Power of Body Language

3) The Application Process:

- Resume Writing
- Effective Cover Letters
- Group Discussions
- Empathy

4) Workplace Communication Skills

- Writing Effective Emails
- The Communication Cycle
- Presentation Skills

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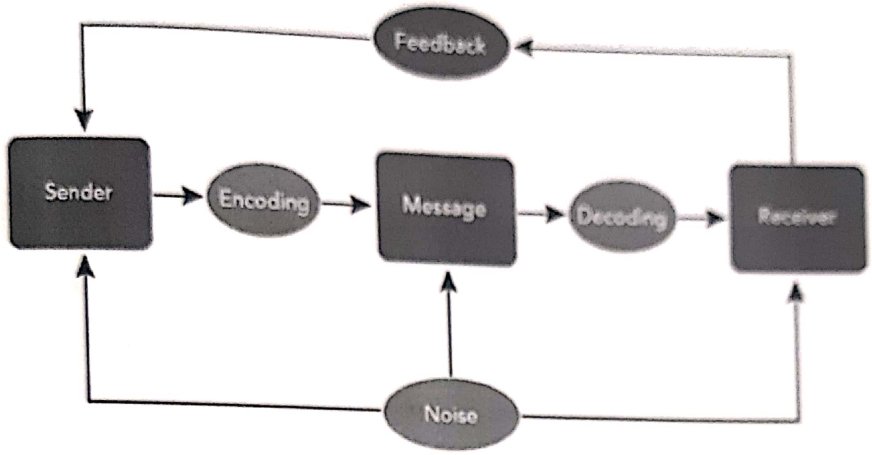
EXPERIENCE DURING INTERNSHIP

1) Introduction to Business Communication:

- Role and Importance of Communication

  Communication is a vital part of society. It plays a lot of roles, and it is essential for survival. People use it to encourage, share ideas, connect, inform, and more. Without communication, there will be a misunderstanding.

- The Communication Process



a. The sender develops an idea to be sent.
b. The sender encodes the message.
c. The sender selects the channel of communication that will be used.
d. The message travels over the channel of communication.
e. The receiver receives the message.
f. The receiver decodes the message.

- Modes of Communication

  - Verbal Communication. Verbal communication occurs when we engage in speaking with others
  - Non-Verbal Communication. What we do while we speak often says more than the actual words
  - Written Communication
  - Listening
  - Visual Communication

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➢ Business Communication Skills

- ✓ Give people what they want
- ✓ Learn some quick problem-solving strategies
- ✓ Use your manners
- ✓ Practice emotional intelligence
- ✓ Pay attention to nonverbal communication
- ✓ But don't rely on it
- ✓ Be a real listener
- ✓ Challenge assumptions (politely!)

2) Essential Communication Skills:

➢ Effective Communication Techniques

- Listening. One of the most important aspects of effective communication is being a good listener.
- Non-Verbal Communication
- Be Clear and Be Concise
- Be Personable
- Be Confident
- Empathy
- Always Have An Open Mind
- Convey Respect

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➢ Introduction to verbal Communication

Verbal Communication is using sounds or words to express you. It involves the sharing of information between individuals using speech. The benefits of verbal communication include: - Saving time instead of spending time writing an email or message. - Receiving/giving instant responses. - Fewer misunderstandings and better interpretation of the message - if you communicate verbally you can clarify on the spot. By sending a message there is a greater chance your message could be misinterpreted due to tone and delayed feedback/response times. - Effective persuasion through body language and showing live emotions. - Maintaining confidentiality (since there is no documentation of the communication; please note that having no proof of a conversation can also be a disadvantage

➢ Fluency, Enunciation, Pronunciation

Fluency is defined as the ability to read with speed, accuracy, and proper expression. In order to understand what they read, children must be able to read fluently whether they are reading aloud or silently. When reading aloud, fluent readers read in phrases and add intonation appropriately. Pronunciation is related to the word itself, focusing on which syllables should be emphasized and how certain letters (or combinations of letters) should sound when spoken. Enunciation refers to how clearly and distinctly a particular individual forms the sounds that make up a word.

➢ The Art of Questioning

The art of asking questions is a tool for unlocking value: it spurs learning, fuels innovation, improves performance, mitigates risk and builds trust. Good questions stimulate strategic conversations, surface crucial assumptions, encourage curiosity, focus enquiry and generate even better questions.

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- The Power of Body Language

  Body language is a sub-set of non-verbal communication that complements our speech when interacting with others. Body language is a collective term for our facial expressions, eye contact, gestures, posture & body movement and phonemics, the use of space around you when communicating with others.

  Body language has a key role to play in communication. It can add additional meaning over and above spoken communication, and it often speaks the loudest! We have the ability to reflect complex attributes like confidence, mood, openness and honesty, through our body language alone.

3) The Application Process

- Resume Writing

  A resume is a formal document that a job applicant creates to itemize their qualifications for a position. A resume is usually accompanied by a customized cover letter in which the applicant expresses an interest in a specific job or company and draws attention to the most relevant specifics on the resume.

- Effective Cover Letters

  A good cover letter complements a resume by expanding on items relevant to the job. In essence, it's a sales pitch that describes why the applicant is the best person for the position.

- Group Discussions

  A discussion involving a number of people who are connected by some shared activity, interest, or quality.

- Empathy

  Emotion researchers generally define empathy as the ability to sense other people's emotions, coupled with the ability to imagine what someone else might be thinking or feeling. ... "Cognitive empathy," sometimes called "perspective taking," refers to our ability to identify and understand other people's emotions.

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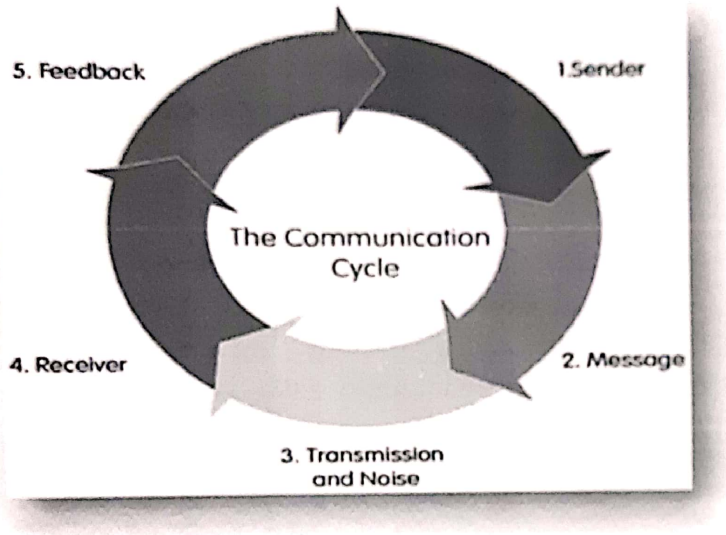
4) Workplace Communication Skills

- Writing Effective Emails

  Emails, like traditional business letters, need to be clear and concise. Keep your sentences short and to the point. The body of the email should be direct and informative, and it should contain all pertinent information. See our article on writing skills for guidance on communicating clearly in writing.

- The Communication Cycle



- Presentation Skills

Presentation skills are the skills you need in delivering effective and engaging presentations to a variety of audiences.

Presentation skills can be defined as a set of abilities that enable an individual to: interact with the audience; transmit the messages with clarity; engage the audience in the presentation; and interpret and understand the mindsets of the listeners. The present era places great emphasis on good presentation skills.

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OUTCOMES

Effective communication at the workplace can help us achieve success in just some of the following ways:

- Stronger relationships
- Understanding & trust
- Clarity and precision
- Enhanced productivity
- Sound decision making
- Swifter responses

CONCLUSION

- Learning Business Communication Skills,
- We can become master in speaking, writing, presentation, English communication and interpersonal skills
- Excel in your field
- Helps to get the dream job

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BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT

AFFILIATED TO

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

2021-2022

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

MAJOR PROJECT REPORT

SUBJECT CODE: VEI85P

"DESIGN AND DEVELOPMENT OF IOT BASED GARBAGE MANAGEMENT SYSTEM"

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2021-2022

PROJECT REPORT ON

"Design And Development Of IoT Based Garbage Management System"

A dissertation submitted to Basaveshwar Engineering College (Autonomous), Bagalkot in partial fulfillment of the requirements for the award of degree of

Bachelor of Engineering
In
Electronics and Instrumentation Engineering

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CERTIFICATE

This is to certify that the project work entitled "**Design And Development Of IoT Based Garbage Management System**" is a bonafide work carried out by Mr. Sujitkumar Goudar, Mr. Gangadhar Goudar bearing University Seat No's: 2BA16EI022, 2BA17EI008 respectively in partial fulfillment for the award of degree of **Bachelor of Engineering in ELECTRONICS AND INSTRUMENTATION ENGINEERING, at Basaveshwar Engineering College(Autonomous), Bagalkot,** affiliated to Vishveshwarya Technological University, Belagavi during the academic year 2021-2022.

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ABSTRACT

Daily garbage production causes increasing in garbage management and cleansing cost which required an approach for better monitoring and management system to be applied this IoT based Garbage Monitoring and Management System has been developed. For hygiene, self-opening dustbin lid is applied and IoT technology is used to integrate better garbage monitoring and management into an innovative and effective system.The development of this smart bin uses a height sensor,weight sensor and an PIR sensor. The smart dustbin notifies the user when the garbage level exceeds 50%,75% and 90%. The dustbin sends a push notification to the user's phone to alert the user to take actions needed before the bin exceed the limit.

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CHAPTER - 1

INTRODUCTION

IoT based telemetry project on optimizing the route of trash collection vehicle by detecting the rubbish level. Things that are no longer useful or wanted and that have been thrown out are referred to as trash or garbage and a container where people put things that are being thrown out are called garbage bins. These bins are located outside a locality where the garbage of the locality is collected and then a vehicle comes which takes all the garbage. This project is designed to optimize the route of these vehicles. The vehicle will be notified about the filled garbage bins so that its garbage can be collected and the vehicle do not waste its time visiting each bins that is empty. This also helps in conserving fuel consumption as now the vehicle do not have to travel the whole round as it will only visit the garbage bins that are filled. A network of IoT is used for notifying the drivers about the filled bins.

The Internet of Things (IoT) is a scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT is also expected to generate large amounts of data from diverse locations that is aggregated very quickly, thereby increasing the need to better index, store and process such data.

1.1.Problem Identification:

The scenario of cleanliness with respect to garbage management is degrading tremendously. Proper garbage management techniques are very crucial to stop the garbage menace which has spread everywhere with this condition of garbage crisis there is a need of applying a method that improves the garbage problems.

1.2.Problem Statement:

Design and implementation of an innovative sensor based garbage management system

1.3.Objectives:

1. To collect data from the sensors attached to the dustbins regarding the level of the garbage collected
2. To show notification if the bin is empty or filled, to the authority
3. To automatically close the bin lid when the bin is about to fill

Existing Solutions

In the current date there are normal dustbins everywhere to collect the waste from the respective houses,industries,hospitals etc, Few of them are mentioned below

1. Normal Plastic Dustbin:

These are the dustbins that are used normally everywhere be it home or offices or any workplace.These dustbins are made of plastic polycarbonate or PVC material. They are durable and lasts long. They are also less expensive. But as the don't implement any technologies in them hence they are nothing more then just a container to hold the waste.

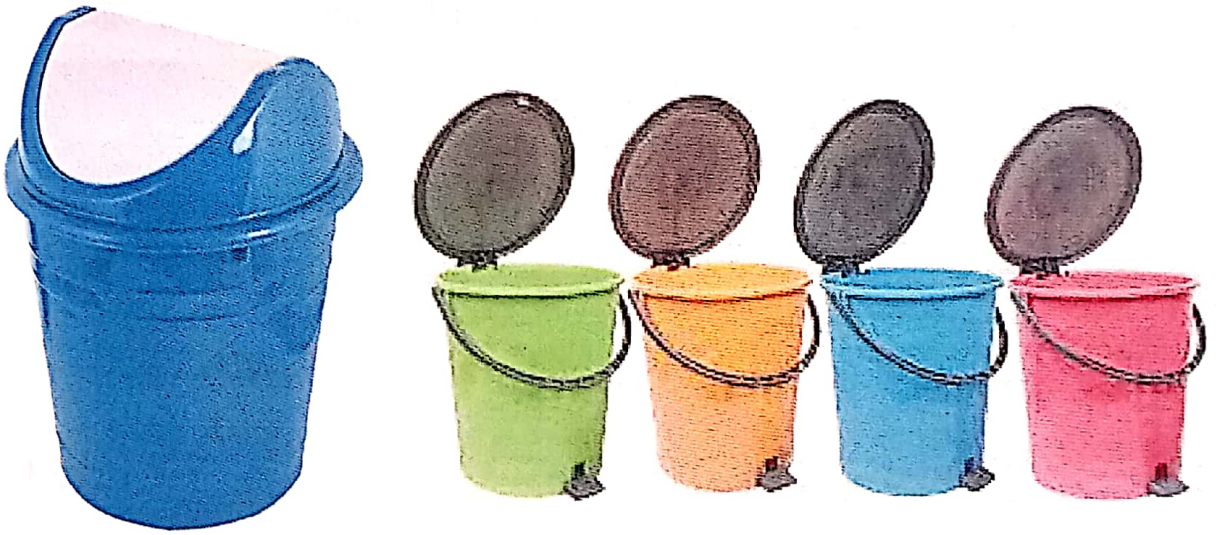

Fig 1.1

2. Smart dustbin:

In the recent advancement in the technology has paved way for development of some smart dustbins. They are either made of good grade plastic or of stainless steel. These dustbins are programmed to automatically open the lid of the dustbin when someone is approaches the bin or some dustbins have certain motion sensor in them which open the lid of the bin for certain hand signs like waving etc.Few of them also have display to show the amount of waste in the dustbins.

Fig 1.2

3. Metal dustbins in industries/used Municipality:

These are usually dustbins made out of large metal sheets for more durability and for longer usage. They are same as that as the plastic dustbin used for domestic uses.

Fig 1.3

1.5.Proposed Solutions:

To over come the waste management problem we have come up with an idea to manage the waste and to monitor the dustbins. This technology can be implemented even to a basic dustbin as well. The idea is to create a dustbin model which can automatically open the lid of the bin whenever someone comes up to throw the waste in the dustbin. This model will also show the amount of waste accumulated in the dustbin using some specific sensors and an LCD display. There is also a GSM system to send message to the concerned authority if the dustbins is about to fill, this way there wont be any overflow of the waste.

CHAPTER - 2

LITERATURE SURVEY

[1]Md Aamir Enam, Sarfaraj Khan,Barsha Singh,Neha Kumari "Smart Dustbins with GSM and ARDUINO Module"International Journal of Latest Technology in Engineering, Management & Applied Science (IJLTEMAS) Volume VI, Issue XII, December 2017 | ISSN 2278-2540

This paper gives the idea on the waste management using e-bin. In which there are different kind of sensors used for the automatic operation of dustbin and control over. There is use of PIR sensor to detect the motion of living beings in particular humans, which helps in the automatic closing and opening of the dustbin. There is also implementation of the GSM and ARDUNIO module to receive notification on mobile about the status of the dustbin making it advanced. This way the user can monitor the empty and full status of dustbin from the anywhere which will further help in saving of time.

[2]Prachi S. Bhalerao , Mrunal R. Jadhav,Soham S. Nikam, Siddhi K.Khamkhedkar,Ms. Divya R. Dhagate"MICROCONTROLLER BASED SMARTDUSTBIN WITH GSM MODULE"International Journalof Advanced Research in Science & Technology(IJARSE) Volume No.07,Issue No.07,March 2018|ISSN 2319-8354 Page No.170-176

In this paper the authors designed a smart dustbin for the waste management of waste in apartments and society.The designed System only one big dustbin is located beside the building or society because from building a pipe is connected to dustbin through building. Where garbage is easily can thrown in the dustbin. These dustbins are provided with IR sensor which helps in level of the garbage bins and so that it is easy to identify which garbage bin is full. When the level reaches the Maximum limit, the IR sensing device will transmit the level along with the message of dustbin these details can be accessed by the concern authorities or garbage van driver of that particular area from their place with the help of GSM Module and an immediate action can be made to clean the dustbins.

[3]Prashanna Rangan, Rithanya. and Rishikesh."E-Dustbin"Journal on Mechatronics and Automation(STMJ)Volume No.4, Issue No.3, 2017| ISSN 2455-1988 Page No. 01-07

This paper gives an idea about the issue of the domestic waste disposal, which will reduce the pollution. The smart bin will help in monitoring the garbage level and the waste disposal can be managed more properly and efficiently by monitoring the bin status. Additional care must be taken in a densely populated area where the waste deposits in the bin are sufficiently high .the bin level is transmitted through server with the help of ultrasonic sensors. At this time we can monitor the dustbin through the network the dustbin level.

CHAPTER-3

TECHNICAL DETAILS

3.1 Hardware description

1. Arduino UNO
2. Transformer
3. Ultrasonic sensor
4. PIR sensor
5. WiFi Module 8266
6. Load Cell
7. Display
8. Voltage Regulator
9. Diode
10. PCB

1. ARDIUNO CONTROLLER:

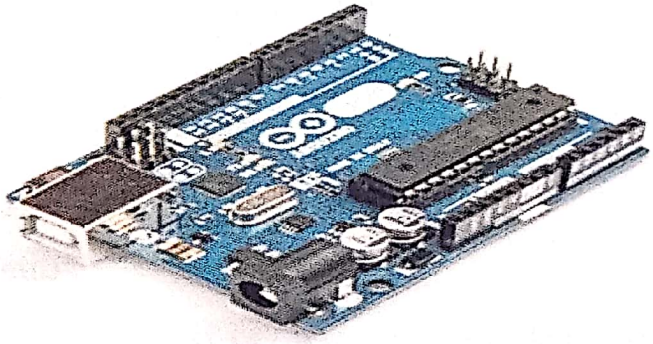

FIG.3.1: Arduino UNO Board

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

Technical specification:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommende	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM outp
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 Ma
Flash Memory	32 KB (ATmega328 of which 0.5 KB used by bootload
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Differences with other boards:

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Power:

The Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

Vin. The input voltage to the Uno board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.

3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND. Ground pins.

IOREF. This pin on the Uno board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

Memory:

The ATmega328 has 32 KB (with 0.5 KB occupied by the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

Input and Output

See the mapping between Arduino pins and ATmega328P ports. The mapping for the Atmega8, 168, and 328 is identical.

Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

LED: 13. There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin

and the analogReference() function.

There are a couple of other pins on the board:

AREF. Reference voltage for the analog inputs. Used with analogReference().

Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

2. Transformer:

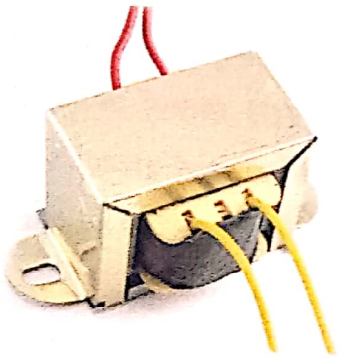

Fig.3.2: Transformer

Transformer is an integral component of the power supply that pulls power from the wall outlet and transforms it or makes it into power that can be used by the electronic device.The transformer outputs its power as alternating current as it receives power from the wall outlet. In power supply application this output is sent to the rectifiers in a power supply that change the alternating current to direct current. A transformer transfers AC signals only by means of a magnetic field at low loss. A transformer consists of two separate coils which have overlapping magnetic fields, so that current flowing in one circuit is coupled to the other. Often, transformers consist of an iron core with two or more coils, which couple magneti-cally. Transformers are used to get voltage gain (at the expense of current reduction) and to step down power line voltages for power supplies. Transformers are also used to match impedances between devices and to provide ground isolation.A typical transformer is layer wound on transformer core (usually so called "E" core). A layer-wound coil consists of single layers of wire separated by layers of insulation. Here, the insulation serves a dual purpose: it is a support platform for the wire and electrical isolation from other transformer parts made of conductive materials (i.e., core, other windings).Nowadays also so called planar transformers have became popular in many pulse transformer and switched mode power supply applications. Those planar transformers use typically a low-profile E-core

ferrite core, which mounts on the board and lets you use board tracks for windings of magnetic components, such as transformers and output chokes in power supplies and chargers. This kind of planr transformers are typically designed to operate ataround 200 kHz to 1.5 MHz frequency. Transformers are not ideal devices. Transformer have losses (typically 5-20% depending on design) when they operate. Those losses heat up the transformer. Let's pick up a normal mains power transformer as an example. There are two kinds of major losses:

copper losses and iron losses. Copper losses are the losses which are caused by the wire resistances in the transformer primary and secondary. Copperlosses are related to wire resistance (wire thickness) and the current trough the wire. The losses increase to the square of the current travelling through transformer. Iron losses are generated in the transformer core material (iron in mains transformer) due magnetic reluctance, induced current circulating in the core and magnetic leakage. Iron losses on transformer core are proportional to the voltage fed to the transformer primary (quare to voltage). The operating frequency does not effect the copper losses, but it has effect on iron losses (higher frequency gives higher losses). Generally iron losses dominate the losses when transformer is not loaded and copper losses dominate the transformer losses when the transformer is heavily loaded. In high frequency transformers the effects descrbed above are the same. In addition to effects above you need to take into account the "skin effect" in the wires and the capacitive losses in thewinding.Genrally in transformer design more iron and the finer the grade of iron(smaller particles = less eddie currents) the more efficient thethransformer. Higher frequencies require finer laminations, then particlecore then air core to keep heating caused by losses down.

3.HC-SR04 ULTRASONIC (US) SENSOR:

As shown above the HC-SR04 Ultrasonic sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

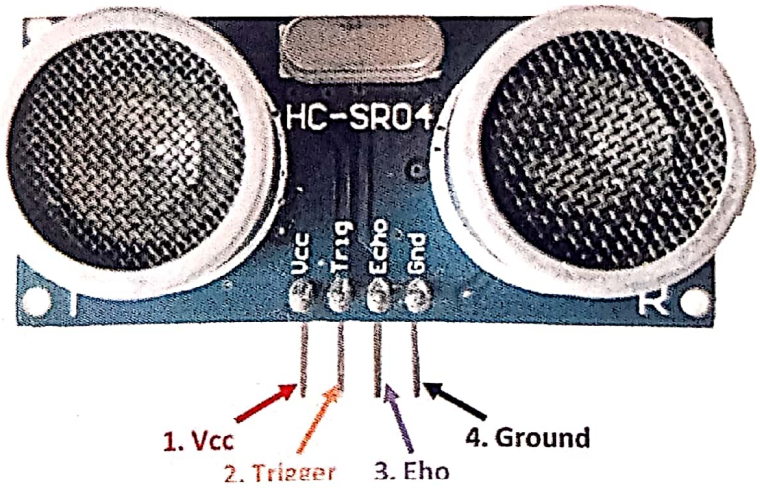

Fig.3.3: ultrasonic sensor

HC-SR04Sensor Features

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

Ultrasonic Sensor Pin Configuration:

Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system

4.PIR Sensor (Passive Infrared Sensor):

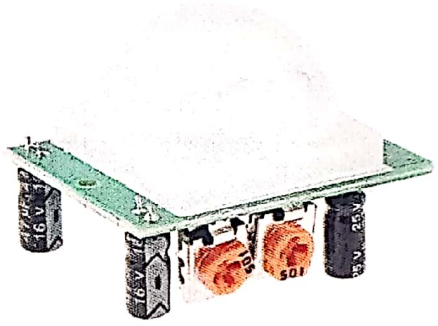

Fig.3.4: PIR Sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

5.WIFI MODULE ESP8266:

ESP8266 (presently ESP8266EX) is a chip with which manufacturers are making wirelessly networkable micro-controller modules. More specifically, ESP8266 is a system-on-a-chip (SoC) with capabilities for 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (16 GPIO), Inter-Integrated Circuit (I^2C), analog-to-digital conversion (10-bit ADC), Serial Peripheral Interface (SPI), I^2S interfaces with DMA (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM). It employs a 32-bit RISC CPU based on the Tensilica Xtensa LX106 running at 80 MHz (or overclocked to 160 MHz). It has a 64 KB boot ROM, 64 KB instruction RAM and 96 KB data RAM. External flash memory can be accessed through SPI.

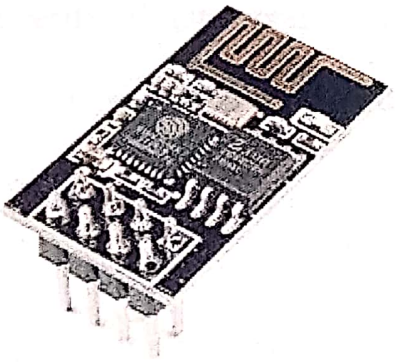

Fig.3.5: WiFi Module ESP8266

6.LOAD CELL:

A load cell is a transducer that is used to create an electrical signal whose magnitude is directly proportional to the force being measured. The various types of load cells include hydraulic load cells, pneumatic load cells and strain gauge load cells. This is a standard load cell for measuring weight upto 5 Kg. The output of the load cell is in mili-volts and cannot be directly measured by a micro-controller. So an ADC with high resolution or an instrumentation amplifier is required to make the output of the load cell readable to a micro-controller.

Specifications:-

- Capacity: 5KG
- Rated output(MV/V): 2.0±0.15
- Accuracy class: C2
- Maximum number of laod cell verification intervals(N max): 2000
- Minimum number of laod cell verification intervals(Vmin): EMax/5000
- Combined error(%RO): <±0.030
- Creep(%RO/30min): 0.03
- Temperature effect on sensitivity(%RO/°C): 0.0016
- Temperature effect on zero(%RO/°C): 0.003
- Zero balance(%RO): 1.0
- Input resistance(O): 402±6
- Output resistance(O): 350±3
- Insulation resistance(MO<50V>): 5000
- Recommended excitation voltage(V): 10~15

- Compensated temperature range(°C): -10~+40
- Operating temperature range(°C): -35~+80
- Safe overload(%RO): 150
- Ultimate overload(%RO): 200
- Load cell material: Aluminium
- Connecting cable: ø4.2x350mm
- Method of connecting wire: Red(+),Black(-),Green(+),White(-)

Applications:-

- Electronic platform scale
- Digital scale
- Parcel post scale
- Electronic balance

7.DISPLAY:

The LCD interfaced to the system was 16 characters and 2 lines type JHD162A from Jin Hang Displays Co. China. The LCD module consists of a Hitachi HD44780 type LCD controller with a Character generator ROM and Display Data Ram. The module consists of 16 interface pins and signals as listed below.

Pin No.	Signal	Description
1	GND	Power Ground
2	VCC	+5VDC Power Input
3	VEE	Contrast Voltage
4	RS	Register Select (0=Command, 1=Data)
5	R/W'	Read/Write Select (0=Write, 1=Read)
6	EN	Strobe Input (A high to low transition latches data to input registers)
7-14	D0-D7	Data Input / Output Lines
15	A	Backlight +5V Power
16	K	Backlight Power Ground

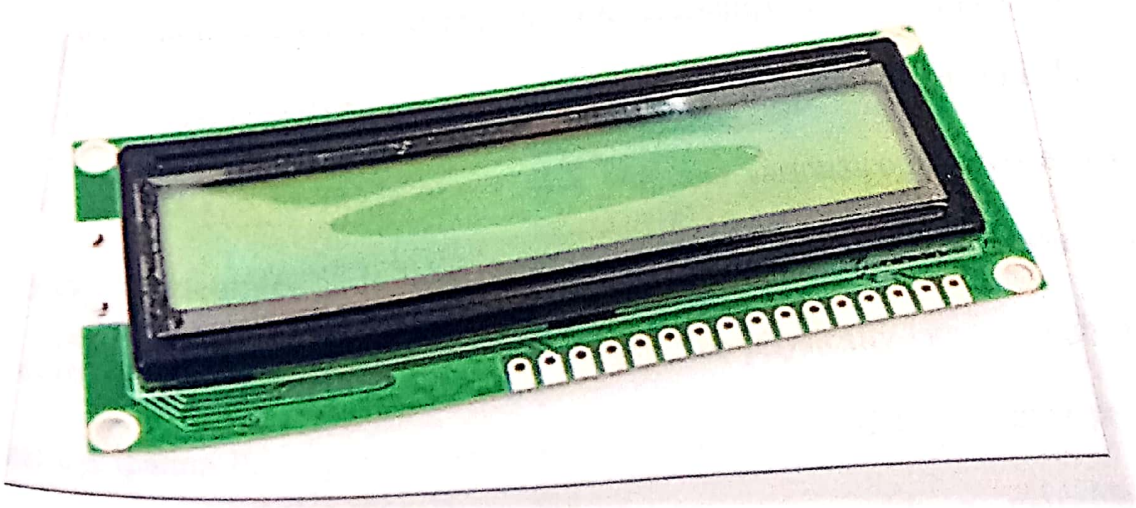

Fig.3.6: Photograph showing the 16X2 LCD Display

The LCD display can be interfaced to the system in either 4 bit or 8 bit data interface length mode but we have selected an 8 bit interface mode for faster display data update. The previous mode could be used in applications where the number of I/O pins availability is limited i.e. A smaller MCU with less I/O Pins. The LCD is interfaced to the MCU with data lines connected to port 1 of the 8051 and control lines RS, EN connected to port 3.2, 3.3 respectively. The R/W control line is permanently tied to ground for write only operations to the LCD display. The program is coded BASCOM8051 basic assembler for 8051 MCU's. The assembled program in the form of an Intel HEX file is generated by the assembler which is further uploaded to the 8051 target board using a In circuit programming software – Flash Magic developed by ESA, for in circuit programming of NXP micro controllers.

a) RESISTORS

A resistor is a two terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminal in proportion to the current, that is, in accordance with ohm's law: V=IR. The resistance are equal to voltage drop V across the resistor divided by current I through a resistor.

Resistors are characterized primarily by the resistance and the power they can dissipate. Other characteristics include temperature co-efficient, noise, an inductance. Practically resister can be made of resistive wire and various compounds and films, and they can be integrated in to hybrid and printed circuits. Size, and position of leads are relevant to equipments designer; resister must be physically large enough not to overheat dissipating there power. Variable resistors, adjustable by changing position of taping on the resistive element , and resistor with a movable tap (potentiometers),either adjustable by user of equipment or contained within, are also used ,Resistor are used as part of electric networks and electronic circuits.

8.Voltage Regulator:

A **voltage regulator** is designed to automatically maintain a constant voltage level. The components on transmitter kit work on 5V power supply. Hence we need a on board voltage regulator which converts the incoming 3-phase AC into 5V DC supply. Here LM7805 regulator is used.

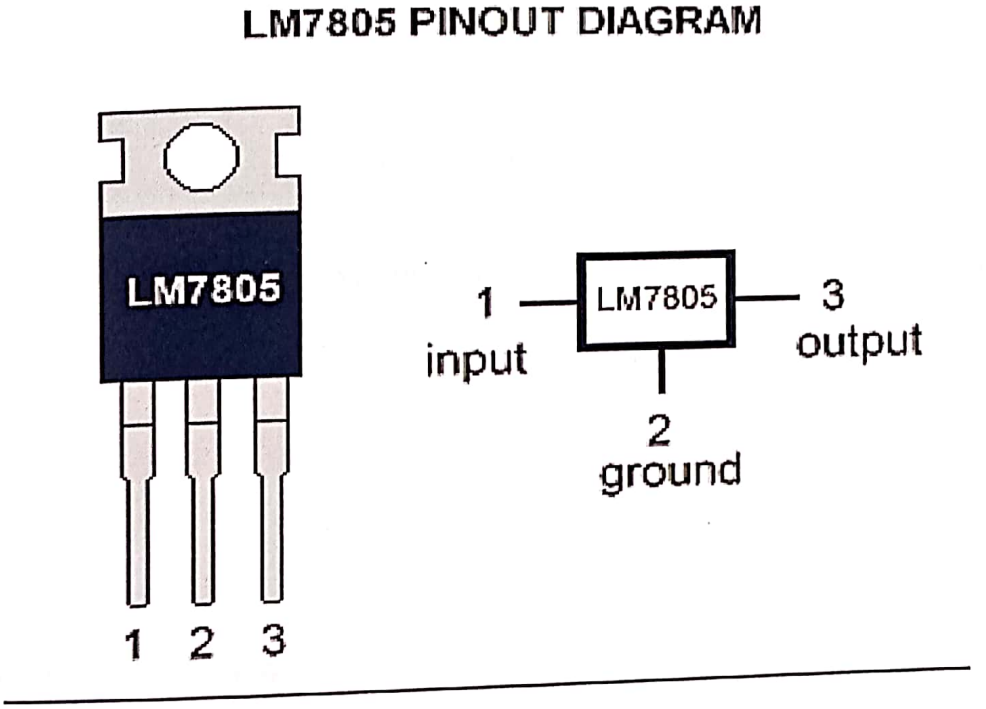

Fig.3.7: voltage regulator pinout diagram

9.Diodes:

To ensure unidirectional flow of the liquids we use mechanical valves in its path. By properly arranging these valves in a system we get useful devices such as pumps and locomotives . In the field of electronics too we have valve called semiconductor diode (a counterpart of thermionic valve) for controlling the flow of electric current in one direction . But we use these diodes in circuits for limited purposes like converting A.C to D.C by passing back E.M.F etc.

Fig.3.8: Diode

A diode allows current to pass through it provided it is forward biased and the biasing voltage is more than potential barrier (forward voltage)

10.Printed Circuit Board:

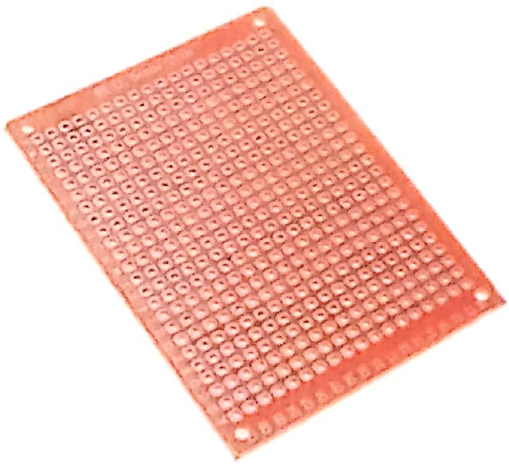

Fig.3.9: Printed Circuit Board

Introduction

Types of boards:-

The two most popular boards are the single sided board and the double sided board. The single sided printed circuit boards are widely used for general purpose application, where the cost is low and the layout is simple.

However the circuit performance is also dependent on selecting the appropriated board to jump over a conducting tracks, jumper wire's are used. If the number of jumper wire are more than the board then the double sided printed circuit boards are preferred.

3.2 Software Description:

The Uno has a number of facilities for communicating with a computer, another Uno board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A SoftwareSerial library allows serial communication on any of the Uno's digital pins.

The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino Software (IDE) includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the Uno board is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2/16U2 is connected to the reset line of the ATmega328 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino Software (IDE) uses this capability to allow you to upload code by simply pressing the upload button in the interface toolbar. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which

it communicates waits a second after opening the connection and before sending this data.

The Uno board contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

CHAPTER-4

Proposed Methodology:

4.1-Block Diagram

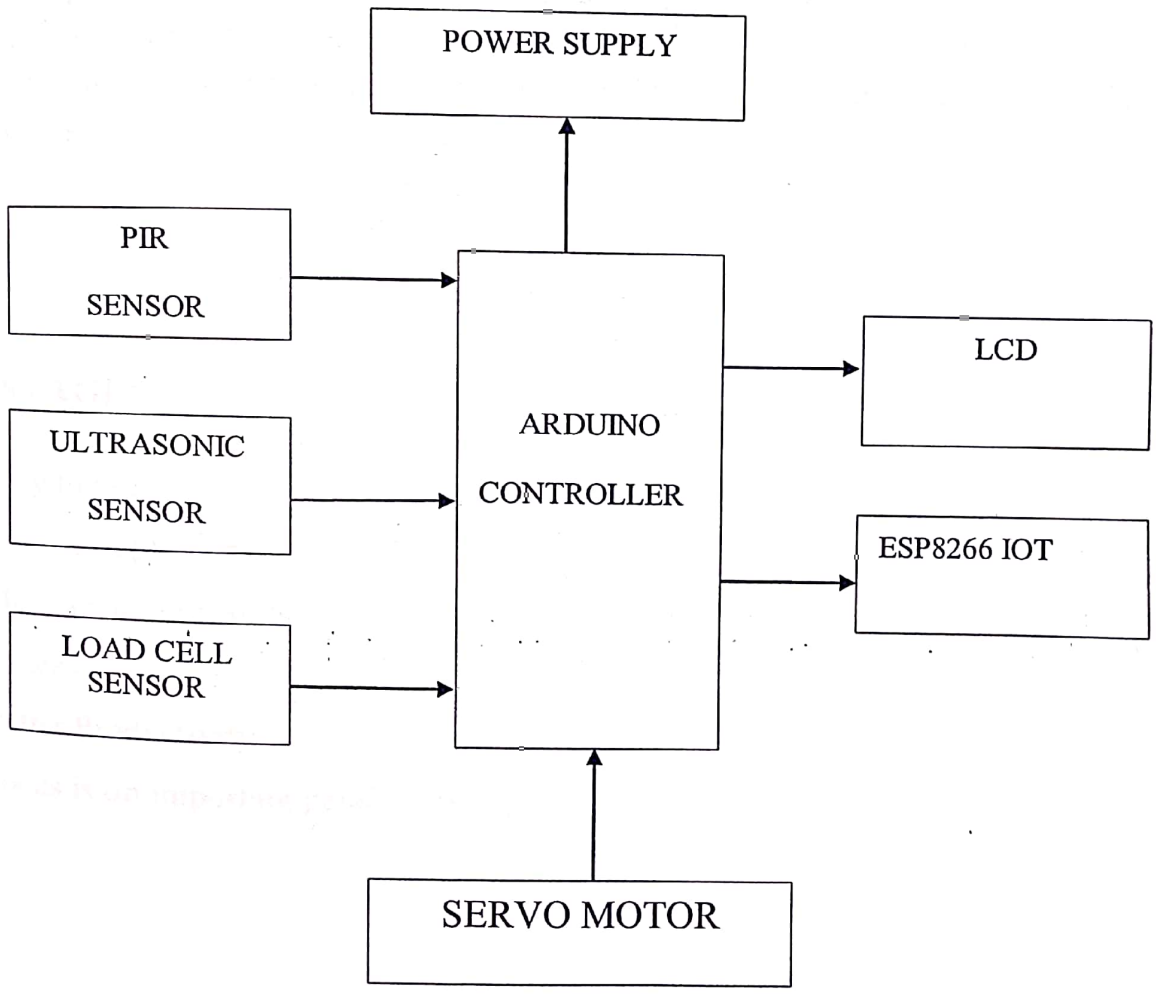

Fig.4.1: block diagram

4.2 -WORKING:

The block diagram for the proposed solution is given in Fig1(a). The whole design is power by a DC supply. The IR sensor is used to detect the human to automatically opening and closing of the lid. The automated closing and opening mechanism is done by using a DC motor and L293D motor drives.There is a LCD display to show the filling status of the dustbin. A ARDUINO micro controller is used to program all the functions of the smart dustbin . There is a SIM 900 GSM module used in the design to send message to the authority about the filling status of the dustbin at to the website called thingSpeak with the help of a wifi module ESP8266. And the data which is received and monitor by the help of the web page created.This is done to make sure that the authority can take action accordingly on the right time before the dustbins fills and overflows.

ADVANTAGES

1. Easy to use
2. Easy to implement
3. More accurate results
4. Increase Fertility
5. Better Productivity
6. Focus is on important parameters

CHAPTER-5

RESULTS AND DISCUSSIONS

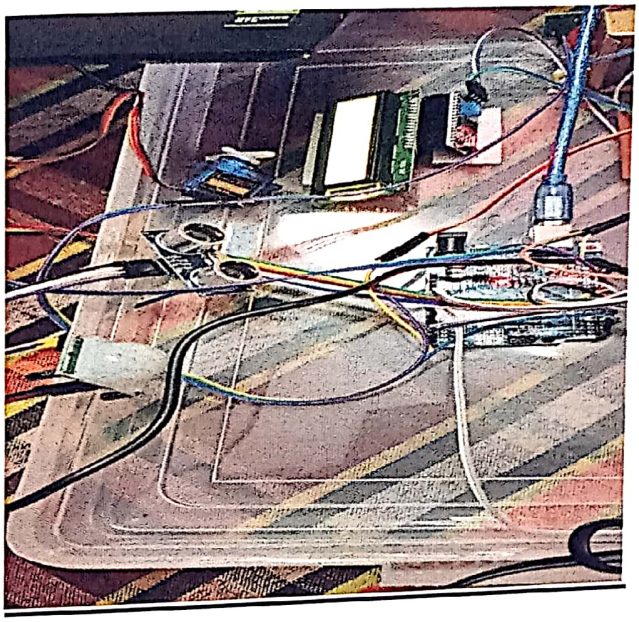

Fig 5.1: Prototype Model

The status of level of garbage is displayed on the display in (fig5.1). This same data is updated on the online IoT website, where the data is monitored by the authority and take actions accordingly.

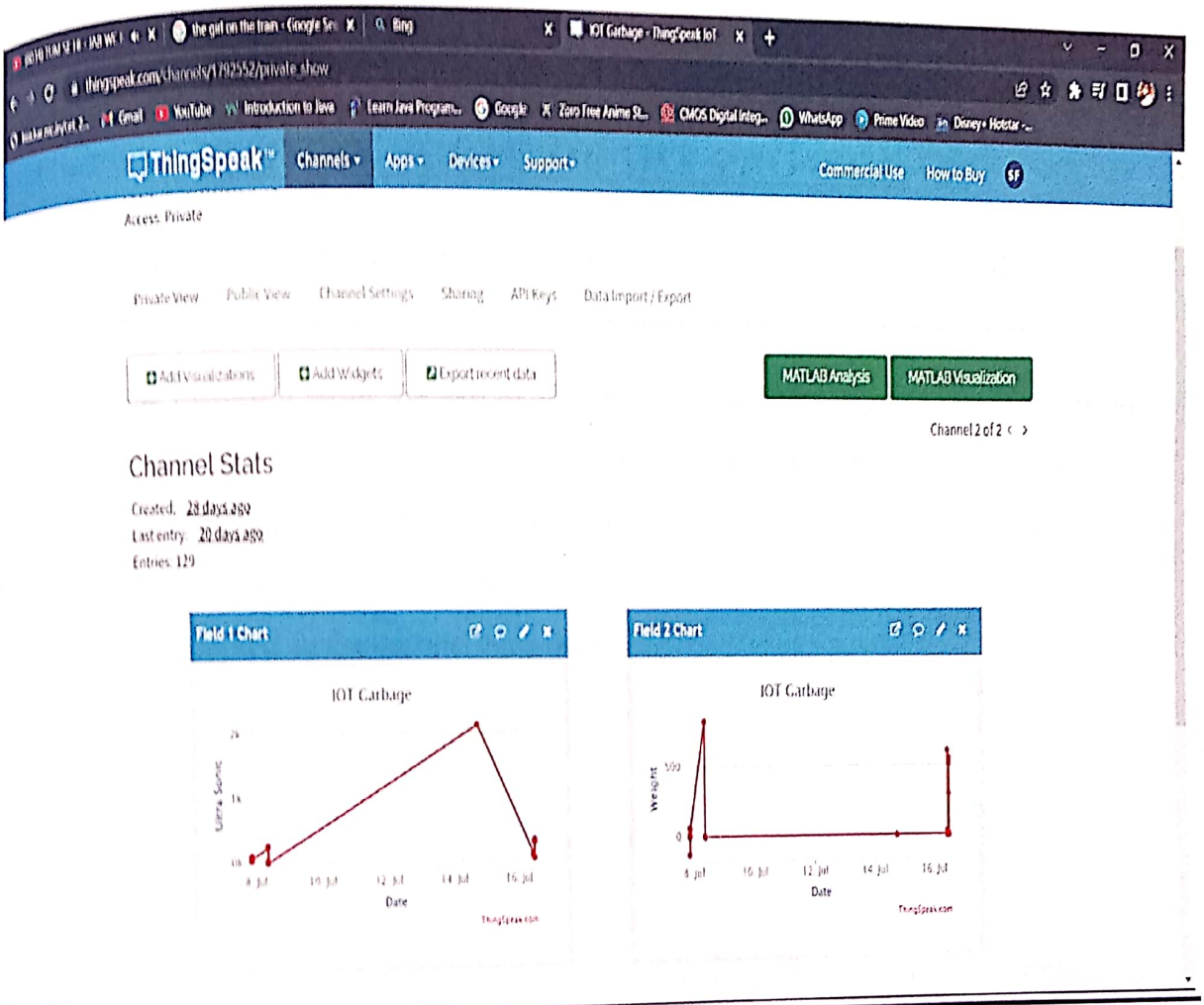

Fig.5.2: Result Displayed on Website

CHAPTER-6

FUTURE SCOPE OF THE PROJECT

We feel the project that we have done has a good future scope in this sector. The main constraint of this device is the high initial cost but has low operating costs.

Savings resulting from the use of this device will make it pay for itself with in short period of time The device affords plenty of scope for modifications, further improvements & operational efficiency, which should make it commercially available & attractive. If taken up for commercial production and marketed properly, we are sure it will be accepted in the public very easily.

CONCLUSION

We have taken up this project as real challenge, as we were not experience in the field. We started our work on this project facing new hurdles initially.

After the completion of the project work we tried its working in our college and we were pleased to note that it does meet the requirements for what it is meant.

The maneuverability of the device is quite good and the handling is quite simple. For commercial purpose one can improve the efficiency of the device effectively by increasing the size of the device.

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VISVESVARAYA TECHNOLOGICAL UNIVERSITY

BELAGAVI - 590018

B. V. V. Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT-587 102

2021-2022

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Internship Report

on

"Industrial 4.0"

Under the Guidance of

Prof. Prashant Madhanavar

(Assistant Professor)

Submitted by:

Name:- Netravati Gabbur

USN:- 2BA18CS034

Semester:-7th sem

B. V. V. Sangha's

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT-587 102

Department of Computer Science & Engineering

CERTIFICATE

This is to Certify that **Netravati Gabbur (2BA18CS034)** have/has satisfactorily completed the Internship on the work entitled "Industry 4.0", in partial fulfillment for the award of the degree of Bachelor of Engineering in Computer Science and Engineering of Visvesvaraya Technological University, Belagavi, during the academic year 2020-2021.

Guide
Prof. Prashant Madhnavanar

Head of the Department
Dr. V. B. Pagi

Name of Examiners

1. Prashant B. M.
2. S. Patil.
3. V. B. Pagi

Signature of Examiner

1.....
2.....
3.....

Gustovalley Technovations

CERTIFICATE OF COMPLETION

This Certifies that

NETRAVATI GABBUR

has successfully completed Gustovalley Technovation's Online Internship on Industry 4.0 which was conducted from 26/08/2021 to 25/09/2021.

The Performance delivered during the program was Good

Date 24-09-2021

Authorized Signatory

Certificate No GL103050

ABSTARCT

Industry 4.0 (the fourth industrial revolution) encapsulates future industry development trends to achieve more intelligent manufacturing processes, including reliance on Cyber Physical Systems (CPS), construction of Cyber-Physical Production Systems (CPPS), and implementation and operation of smart factories. This paper introduces relevant aspects of Industry 4.0 in relation to strategic planning, key technologies, opportunities, and challenges. Strategic planning includes construction of a CPS network, discussion of two major themes which are based on the smart factory and intelligent production, achieving three integrations (horizontal integration, vertical integration and end-to-end integration) and achieving eight plans which consist of the formulation of system standardization, efficient management etc. Finally, it referred to the enlightenment for China's manufacturing industries, to build China's Industry. Industry 4.0 is a very popular topic today because of its big influence on manufacturing. Industry 4.0 is focused on creating "smart" environment within the production system. Several priority areas of action, in order to get closer to the state of Industry 4.0., are shown. There are also the most important changes, that will occur in the manufacturing operations and information technology. Some leading manufacturers of technology for Industry 4.0 are presented. Many papers explore new business concepts and strategies for adaption to new industrial revolution. This paper provides an overview of several concepts and strategies. Different strategies and concepts selected from the literature are compared in order to detect the areas that are not covered.

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1. Introduction

We're in the midst of a significant transformation regarding the way we produce products thanks to the digitization of manufacturing. This transition is so compelling that it is being called Industry 4.0 to represent the fourth revolution that has occurred in manufacturing. From the first industrial revolution (mechanization through water and steam power) to the mass production and assembly lines using electricity in the second, the fourth industrial revolution will take what was started in the third with the adoption of computers and automation and enhance it with smart and autonomous systems fueled by data and machine learning.

This manufacturing revolution will increase productivity, shift economics, foster industrial growth, and modify the profile of the workforce—ultimately changing the competitiveness of companies and regions.

As the adoption of Industry 4.0 is increasing day by day across various industries, the scope for the skill sets will be enormous for the driving technologies of Industry 4.0

The technologies of Industry 4.0 include Integrated System, IOT, Data Management, Cloud Computing, Cyber security, Artificial Intelligence, Additive Manufacturing, Augmented Reality.

2. Overview of Internship Organization

Gustovalley Technovations Llp is a Limited Liability Partnership firm incorporated on 13 December 2018. It is registered at Registrar of Companies, Coimbatore. Its total obligation of contribution is Rs. 10,000. Gustovalley Technovations is automation-based company working towards the goal of Digital transformation. Gusto Learn is the initiative of Gustovalley Technovations which focuses on offering Industry training to the students. The students will good exposed to the latest technologies and will have the opportunity to work on Solutions for the Realtime problems. Our course is designed in such a way that each student will get complete hands-on experience and will have deeper understanding of concepts by working on projects and assignments to solve real-time problems. Designated Partners of Gustovalley Technovations Llp are Lakshmi Bose and Maheswari Alagesan.

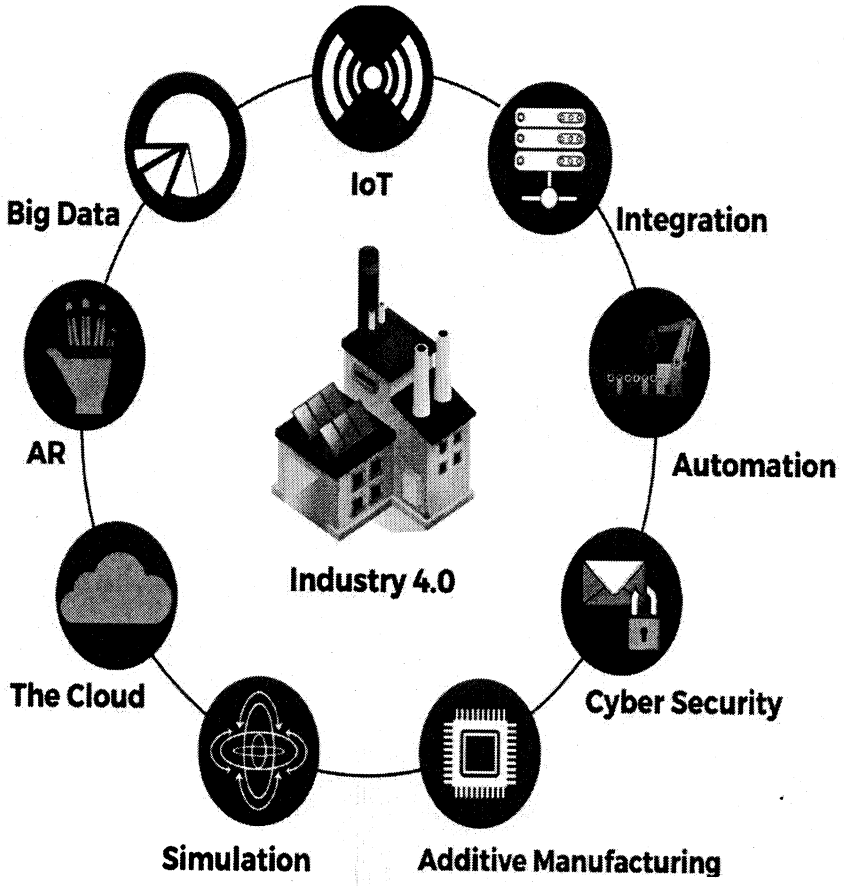


Fig 2.1 Different domains of the company

3. Plan of Internship Training

3.1. Learning Objectives

- To assist development of employer-valued skills such as teamwork, communications and attention to detail.
- To get exposure to the environment and expectations of performance on the part of accountants in professional accounting practice, private/public companies or government entities.
- To enhance and/or expand the knowledge of a particular area(s) of accounting.
- To expose the professional role models or mentors who will provide the student with support in the early stages of the internship and provide an example of the behaviors expected in the intern's workplace.
- Development of Embedded system to continuously monitor sensor data and control appliances.
- Development of Android app
    - Real time dashboard to show parameters
    - Control of IOT system
    - Report generation
- Development of Python dashboard for real-time data visualization and Machine learning prediction model to predict water consumption.
- Python Image processing system to detect the objects and add to the Counter in the Server.

3.2. Schedule

Weeks	Content Covered
Week-1	Embedded System And IoT
Week-2	Internet Of Things And Introduction To Blynk Application For IoT
Week-3	Development Of Server For Monitoring And Controlling IoT Devices
Week-4	Python -Data Science And Machine Learning
Week-5	Image Processing
Week-6	Dashboard Of IoT App And Augmented Reality

8.3. Attendance

Gustovalley Technovations

Internship - Continuous Internal Evaluation by Industry Representative

ATTENDANCE REPORT

Student Name : Netravati Gabbur

WEEK / DAYS	WEEK-1	WEEK-2	WEEK-3	WEEK-4	WEEK-5	WEEK-6
MONDAY	✓	✓	✓	✓	✓	✓
TUESDAY	✓	✓	✓	✓	✓	✓
WEDNESDAY	✓	✓	✓	✓	✓	✓
THURSDAY	✓	✓	✓	✓	✓	✓
FRIDAY	✓	✓	✓	✓	✓	✓
SATURDAY	✓	✓	✓	✓	✓	✓
SUNDAY	✓	✓	✓	✓	✓	✓

University Serial Number (USN) : 2BA18CS034

Name of the Company/Industry : Gustovalley Technovations (Industry 4.0)

External Guide Signature

8.4. Feedback Received

B. V. V. Sangha's

Basaveshwar Engineering College (A), Bagalkot

Department of Computer Science and Engineering

Internship - Continuous Internal Evaluation by Industry Representative

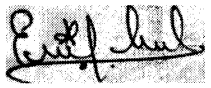
1. Internship Details

Internee/Student Name	: Netravati Gabbur
University Serial Number(USN)	: 2BA18CS034
Name of the Company/Industry	: Gustovalley Technovations
Address of the Company	: 13th cross,bharathidasan nagar, Hosur, Tamil Nadu 635109

Topic/Domain/Title of the internship	: Industry 4.0
Mode of Internship	: Online
Date of Commencement	: 26/08/2021
Date of Completion	: 25/09/2021
Duration in number of weeks	: 5 weeks
Number of Training Days	: 33 Days
Number of Days Intern/Student attended the Training	: 33 Days

External Guide Details :

Name	: Ejaz Ahmed
Designation	: Senior Product Developer
Email-id	: ejaz@gustovalley.in
Contact Number	: 7373528375



External Guide Signature

4. Training Program (What I Have Learned?)

4.1. Detailed Description of Systems/Methodology/Algorithm/Technology/Operations

4.1.1. Embedded System and IoT

Embedded systems are part and parcel of every modern electronic component. These are low power consumption units that are used to run specific tasks for example remote controls, washing machines, microwave ovens, RFID tags , sensors, actuators and thermostats used in various applications, networking hardware such as switches, routers, modems, mobile phones, PDAs[4].

Usually embedded devices are a part of a larger device where they perform specific task of the device. For example embedded systems are used as networked thermostats in Heating, Ventilation and Air Conditioning (HVAC) systems, in Home Automation embedded systems are used as wired or wireless networking to automate and control lights, security, audio/visual systems, sense climate change, monitoring, etc.

Embedded systems will also be at the cornerstone for the deployment of many Internet of Things (IoT) solutions, especially within certain industry verticals and Industrial Internet of Things (IoT) applications.

Major players in embedded system hardware and software developments are aiming to bring these transformations into their products to take advantage of growing IoT market. The areas that are going to transform are Real Time Operating Systems (RTOS) and microprocessors and microcontrollers, followed by memory footprints and networking, open source communities and developers.

In the first week we learned about the basics of Embedded system and IOT by understanding one of the most commonly used Microcontroller for Prototyping in Industry, Node MCU ESP8266 and also Arduino UNO.

We have also learned how to get start with the Micro Controller by understanding the Architecture, pinout and documentation of the Micro controller. This has given confidence that we can easily to any new Microcontroller used in Industry by looking at its architecture.

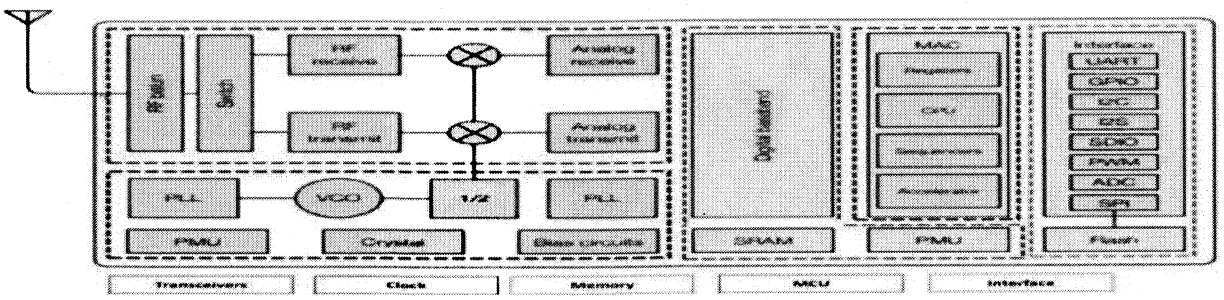


Fig 4.1.1(a) Architechure of ESP8266 and Arduino UNO

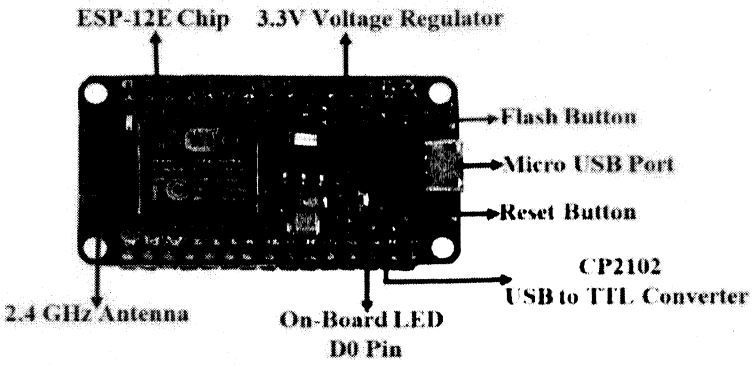


Fig 4.1.1(b) ESP8266 Pinout Diagram

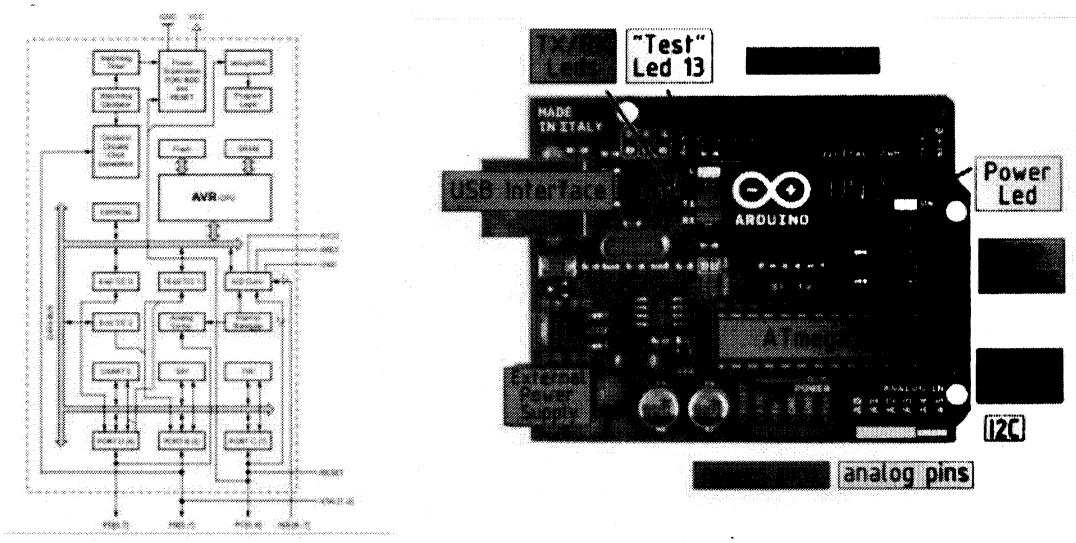


Fig 4.1.1(c) Arduino Uno Architecture

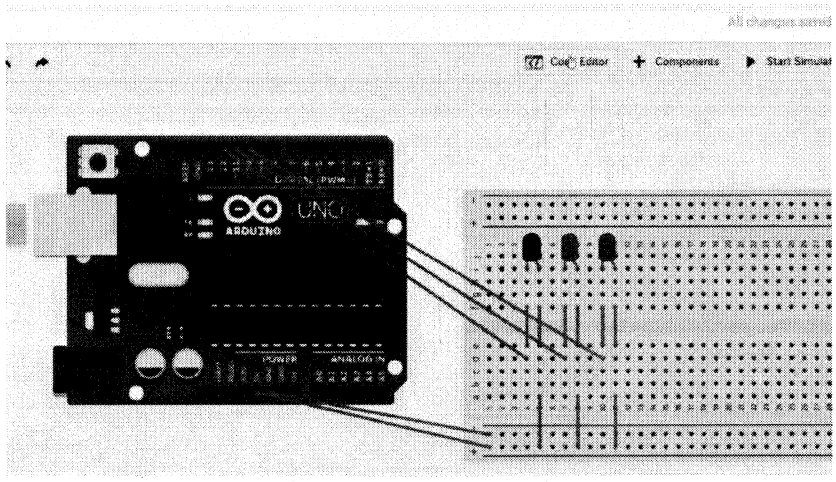


Fig 4.1.1(d) Tinkercad Simulation

We had a real-time working experience with simulation platform. We worked on all components and had a Hands on experience working on assignments. We have also used Arduino IDE platform for Compilation and uploading of code to controller

We also learned ADC and PWM concepts by working on application-based assignments.

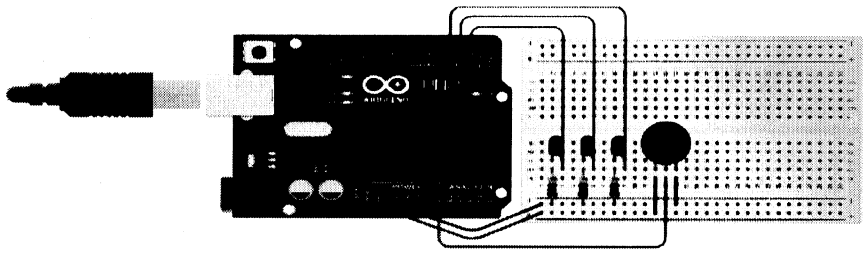


Fig 4.1.1(e) Example on Tinkercad

In IOT front we learned Communication model and various communication protocols

OSI Layers

The Open Systems Interconnection model (OSI model) is a conceptual model that characterizes and standardizes the communication functions of a telecommunication or computing system without regard to its underlying internal structure and technology. Its goal is the interoperability of diverse communication systems with standard communication protocols. The model partitions a communication system into abstraction layers.

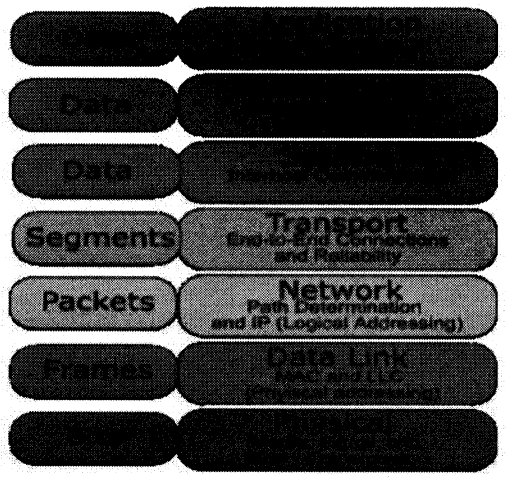


Fig 4.1.1(f) OSI model

We also learned the basics of IP address, MAC address, IP Address classes, Subnet masking.

TCP Protocol

- Transmission Control Protocol (TCP)
- One-to-one and connection-oriented reliable protocol
- Used in the accurate transmission of large amount of data
- Connection-oriented
- Stream Data Transfer
- Reliable
- Flow-Control
- Full-Duplex
- Slower compared to UDP because of additional error checking being performed
- Suited for critical data transfer applications

TCP (Transmission Control Protocol) is a standard that defines how to establish and maintain a network conversation through which application programs can exchange data. **TCP** works with the Internet Protocol (IP), which defines how computers send packets of data to each other.

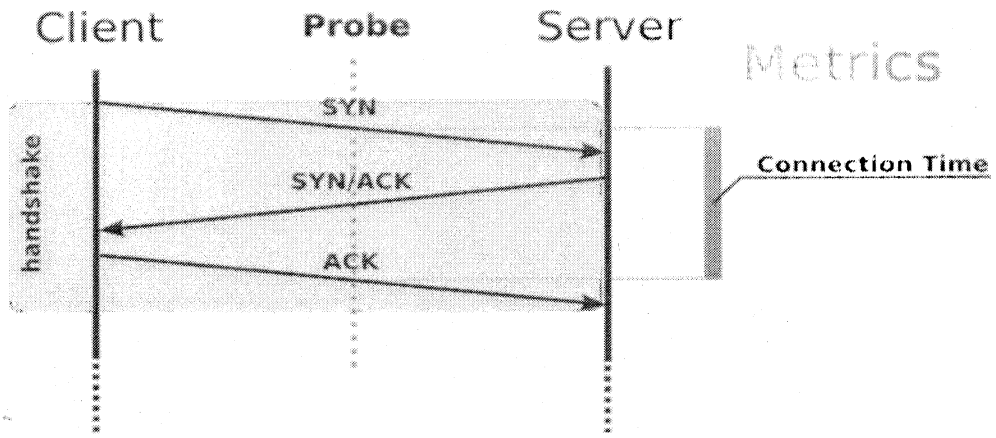


Fig 4.1.1(g) TCP/IP model

Introduction to Blynk application for IOT

Using Blynk app we made a IOT mobile App for controlling ESP8266. This library is compatible with all architectures so you should be able to use it on all the Arduino boards.The Blynk Server will act as a Cloud for our IOT device and with the device we controlled various home appliances.

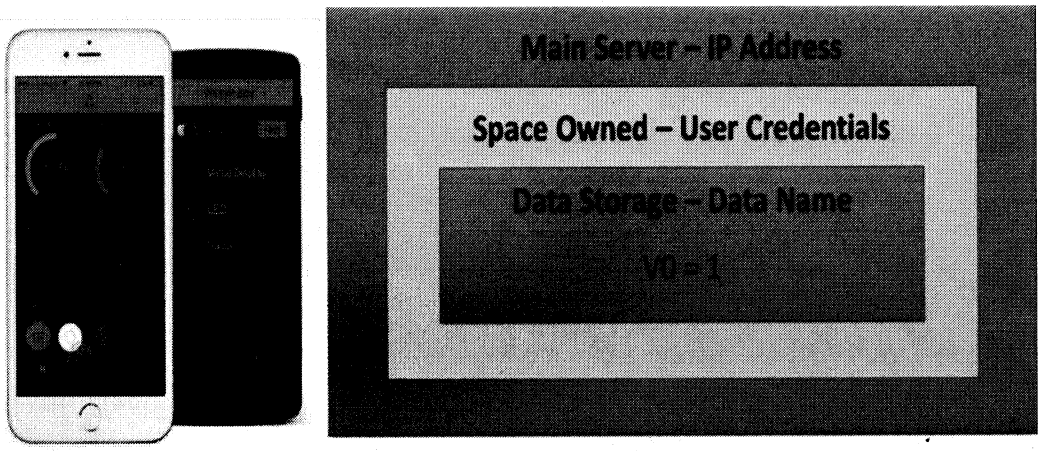


Fig 4.1.1(h) IOT application using Blynk

We created an IoT application using Blynk app to control various appliances and

also to dashboard to monitor devices remotely. This working has given us confidence to use this learning in Industry for controlling and monitoring of the machines.

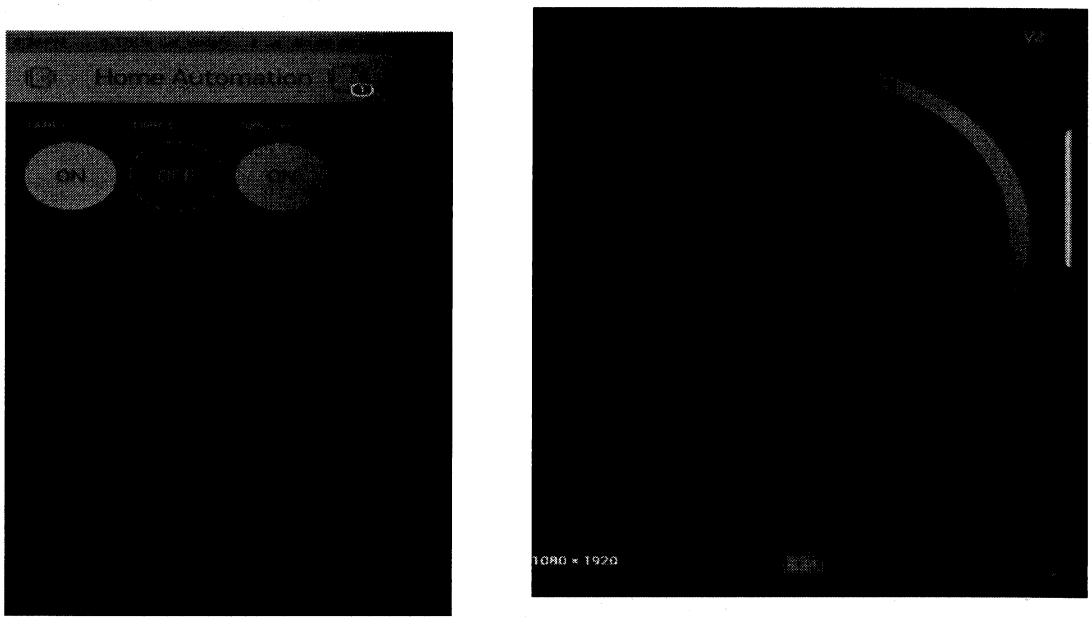


Fig 4.1.1(i) Home automation using Blynk application

4.1.2. Development of Server for Monitoring and Controlling Iot Devices

After having been exposed Controlling IOT devices using 3rd Party Blynk application. In 2nd Week we have been trained on Setting up hosting server to not only connect our IOT devices but also to develop a webpage as an interface to control and monitor the IOT device.

Initially we have been trained on HTML, CSS program to understand the components of Webpage and we also hosted our Webpage in a server. After having basic knowledge on Webpage, we were trained to handle SQL database and PHP interface to capture the status of the Microcontroller.

During this we have developed two API links, one link to update data in the server and 2nd link to read the status of the controller from the Server.

After creation of the API links we developed a webapp to control our IOT devices.

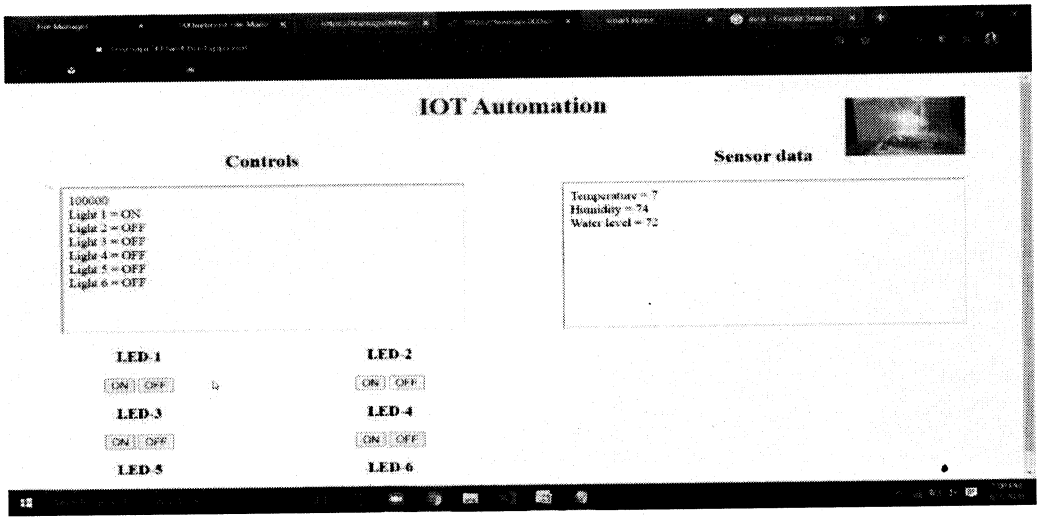


Fig 4.1.2. Creation of API link to control IOT devices

4.1.3. Python - Data Science, Machine Learning and Image Processing

In the third week we have got introduced to one of the most widely accepting language, Python. Earlier we started with basics of Python. We have used Jupyter notebook platform for compiling and running our code. In Python basics we learned Operations, Datatypes,Decision making, Looping, Functions and Classes[5].

We then used Data processing libraries Numpy and Pandas for numerical array operations. We understand the Data processing techniques by working on the datasets.

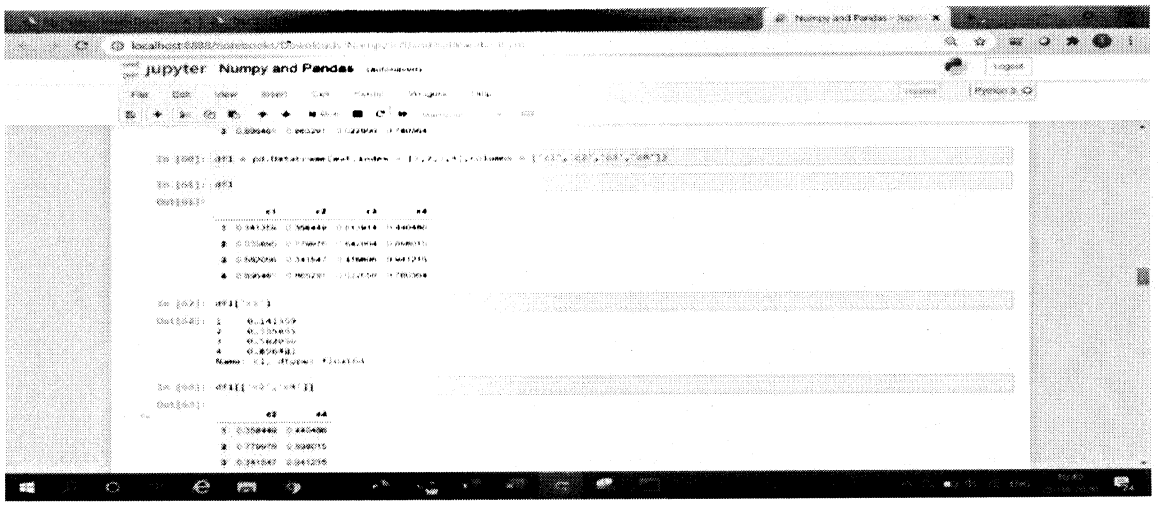


Fig 4.1.3(a) Creating data on Anaconda Software

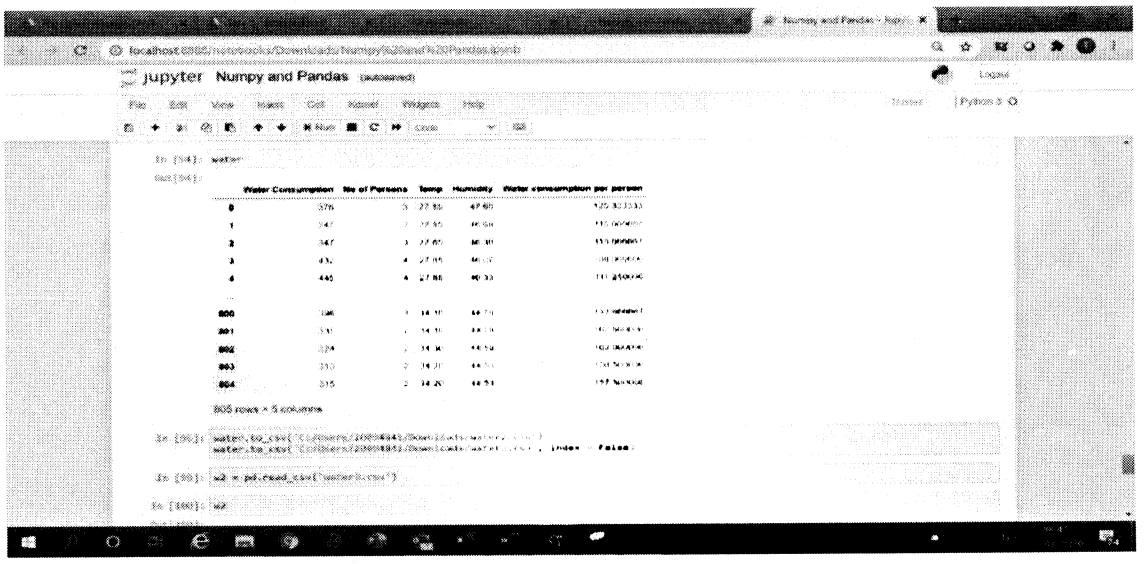


Fig 4.1.3(b) Example for Jupyter console

We then learned the concepts of Exploratory Data Analysis (EDA) and applied the learnings of Data Preprocessing from Numpy and Pandas library to our IOT water consumption data set and visualized our dataset using Matplotlib and Seaborn library. From the visualization of our dataset we have found several insights and identified the principal components for our Machine learning process.

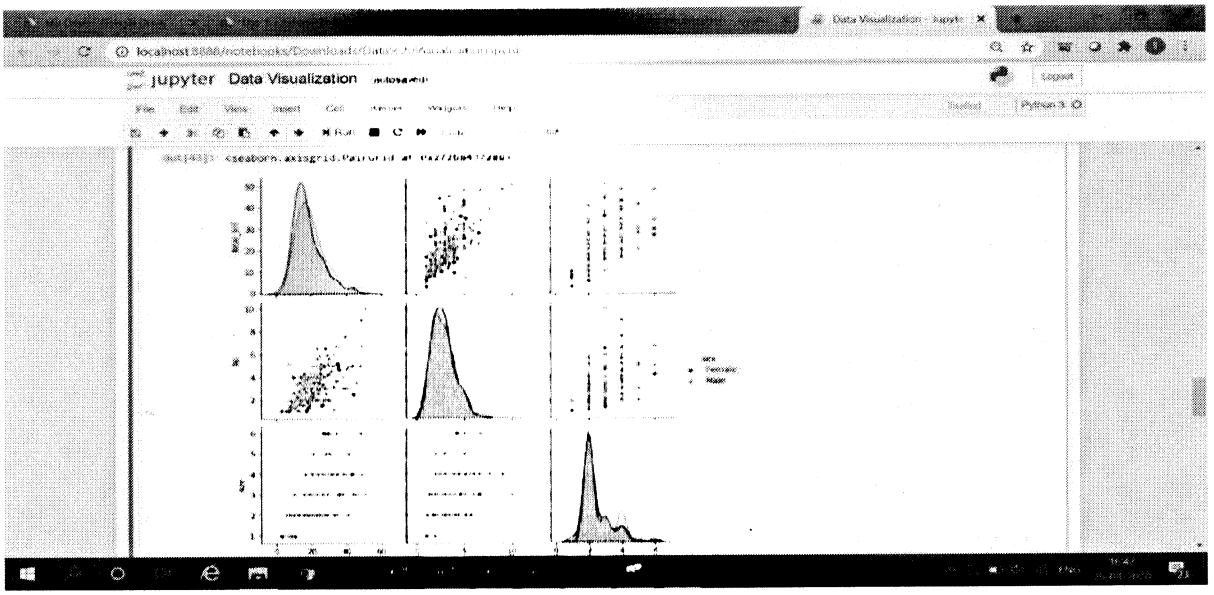


Fig 4.1.3(c) Data Visualisation On Jupyter

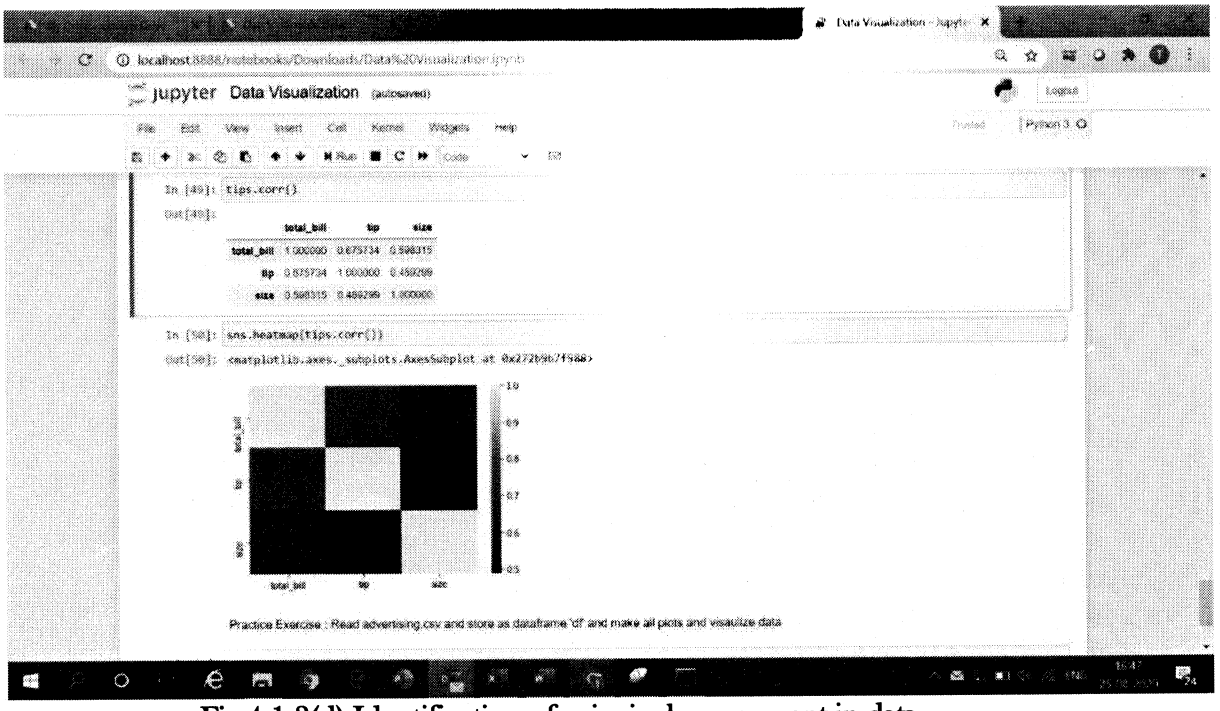


Fig 4.1.3(d) Identification of principal component in data

We have then jumped to Machine learning techniques using Python. We have been learned about the types of machine learning techniques. There we went deeper in to Linear Regression techniques starting from the principle, working and algorithm.

We then learned working on Scikitlearn Library for developing a

prediction model to predict the water consumption based on temperature and Humidity data.

After pre-processing and visualization of our data, We divided our data set in to Training data (70%) and testing data(30%) and using Scikitlearn Library we developed a Machine learning model using the training data and calculated the coefficient and the intercept. After development of the model we then compared the result from the Training model and actual data by feeding the test data set in to the model.

We found that our model is 97% accurate by considering the Root Mean Squared Error.

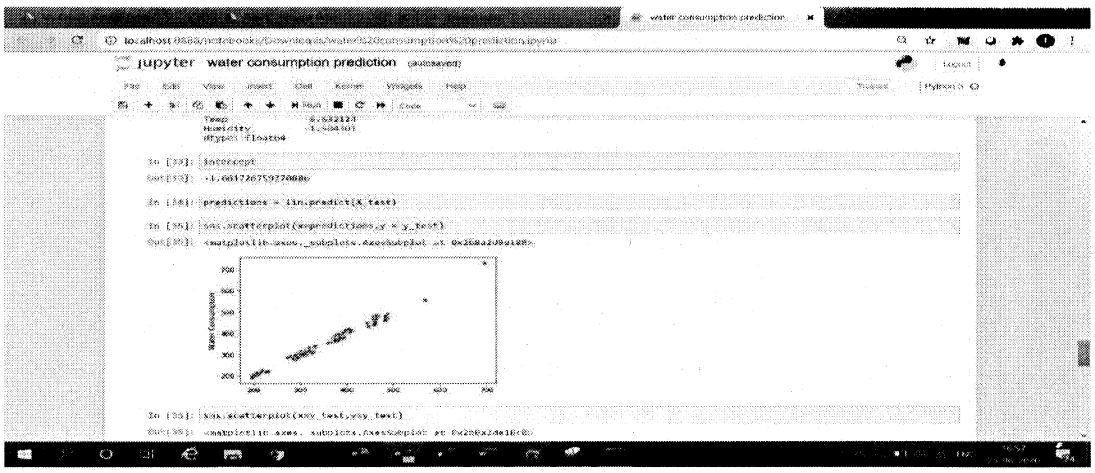


Fig 4.1.3(e) Water Consumption prediction model using machine learning

Computer vision using Python

Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Using digital images from cameras and videos and deep learning models, machines can accurately identify and classify objects – and then react to what they "see."

Open CV is the open source library for Python for Image processing. We

have learned the various image processing concept and practiced the Same in Jupyter notebook.We have learned the concepts of image manipulation, Object detection and Face detection concepts.We have developed an Python app to calculate manhours in the company based on the video feed.

4.1.4. Dashboard of IoT App and Augmented Reality

This week we have taught how to develop an Android app using MIT app inventor where we will build app using the drag drop concept. Through this module we developed an Mobile App which will connect to our Database and the Database being connected to our IOT devices. The Mobile app can able to read the status of the IOT device and also can able to control the IOT device by updating the value in Database.

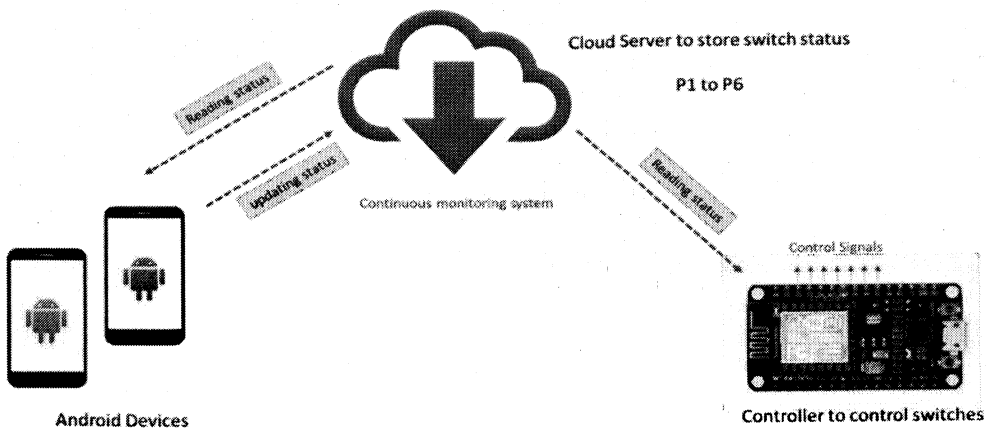


Fig 4.1.4 Dashboard of IOT app and augmented reality

We have also developed the Augmented Reality mobile app using unity game engine which will display the Realtime dashboard in the virtual world.

The AR app is connected to our database and will display the Real time Temperature, Humidity and Water level in the Virtual space.

This has opened the scope of various application in Industry to monitor the various parameters of machines and alert the maintenance team with ease.

5. Analysis

ngs/Experiements/Results/Proofs/Outcome

ome Automation System using Tinkercad Simulation

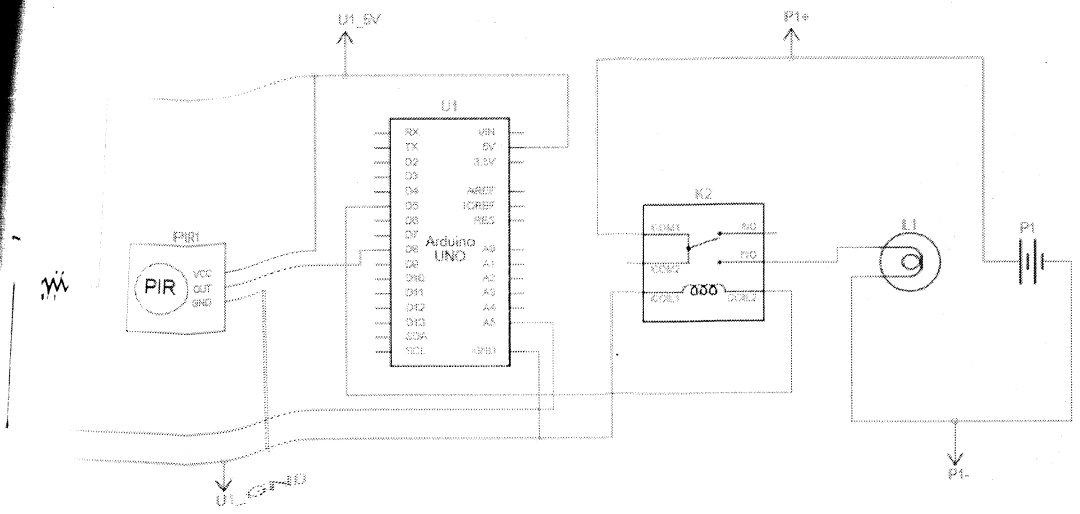


Fig 5.1(a) Circuit diagram for Home Automation System

ntation

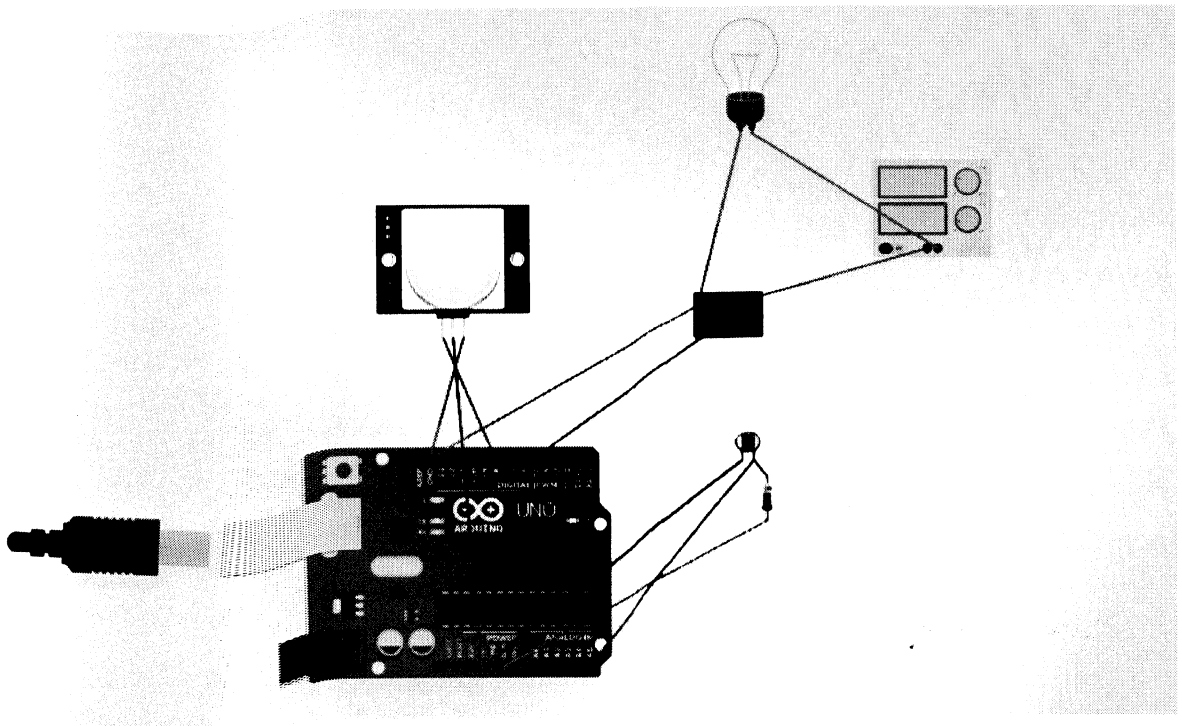


Fig 5.1(b) Implementation for Home Automation System

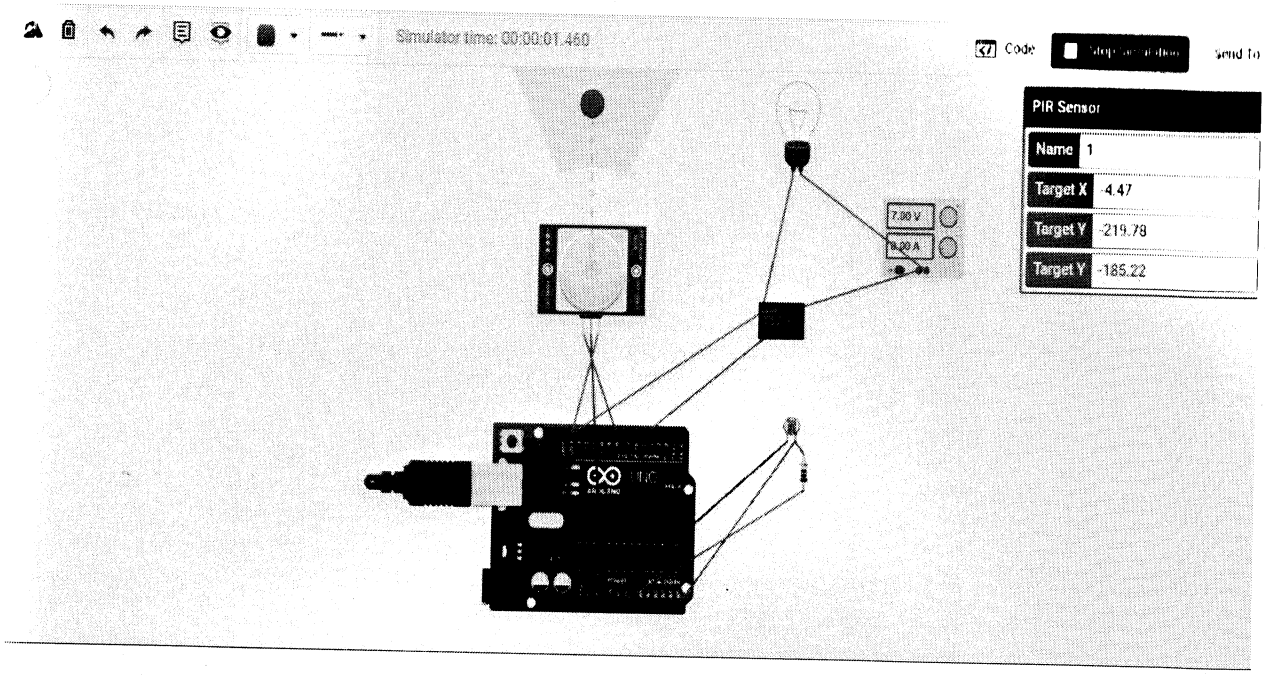


Fig 5.1(c) Bulb is not glowing

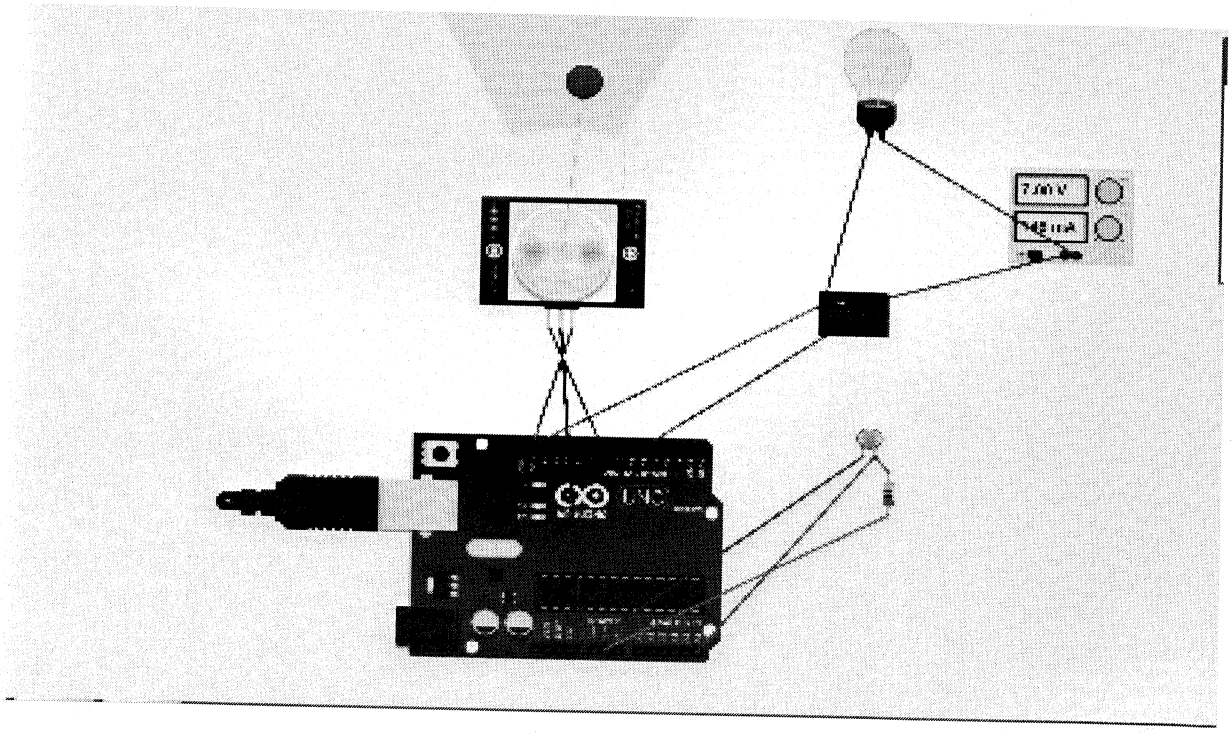


Fig 5.1(d) Bulb is Glowing

Result

If the room detects any movement, the light (Bulb) will automatically be lighting. If there is no movement in the room, then the light will remain off. (I used here PIR for detecting movement and Bulb for light)

Outcomes of the Internship

- Exposed to various software like tinkercad simulation, Anaconda software.
- Familiarized with components like Arduino UNO, Node MCU.
- Some basic knowledge we gained regarding IOT, Embedded system, and Python.
- Overview of the present technologies of Industry 4.0

6. Conclusion

- The Internship mainly focused on the concept of the fourth industrial revolution, called Industry 4.0 which allows smart and efficient production at reasonable cost.
- With the help of faster computers, smarter machines, smaller sensors, cheaper data storage and transmission could make machines and products smarter to communicate with each and learn from each other.

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4. N. G. Nayak, F. Dürr and K. Rothermel, "Software-defined environment for reconfigurable manufacturing systems, " Internet of Things (IOT), 2015 5th International Conference on the, Seoul, 2015, pp. 122-129.

5. Thomas Bauernhansl, Jörg Krüger, Gunther Reinhart, Günther Schuh: Wgp- Standpunkt Industrie 4.0, Wissenschaftliche Gesellschaft für Produktionstechnik Wgp e. v., 2016.

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BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS),
BAGALKOT

UNDER

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

MINI-PROJECT-UCS656P

ON

"BEC ATTENDANCE AND MARKS MANAGEMENT SYSTEM"

FOR THE ACADEMIC YEAR 2021-2022 SUBMITTED

BY

PALLAVI C. 2BA19CS047

SAHANA K. 2BA19CS062

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BELAGAVI

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

THIS IS TO CERTIFY THAT PALLAVI C(2BA19CS047),SAHANA (2BA19CS062),VIBHA(2BA19CS090), AND ROOPA(2BA20CS405)HAVE SATISFACTORILY COMPLETED THE MINI-PROJECT ON "BEC ATTENDANCE AND MARKS MANAGEMENT SYSTEM" AS PRESCRIBED BY THE UNIVERSITY FOR SIXTH SEMESTER B.E. CLASS OF THE COLLEGE DURING THE YEAR 2021-2022.

GUIDE	CO-ORDINATOR	HOD
Ms. J. M. HURAKADLI	Dr. S. M. HATTURE	Dr. V.B. PAGI

1. Dr. Praveen S.C. 22/2/22
2. Dr. C. V. Sahyadri 27/7/2022
3. Dr. Vishwanath K. Kagawad 28/2/22 ← Examiner's Sign

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We also thank the head of the department Dr. V. B. PAGI for encouraging and motivating us tocomplete challenging projects.

We also thank the project coordinator Dr. S. M. HATTURE for his guidance and whole hearted support to successfully complete the project.

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REFERENCE

ABSTRACT

BECattendanceand marks managementsystemdealswiththemaintenanceofthe student's attendance and marks details. It maintains the attendance of thestudents on basis of theirpresence in the class on the daily basis. The staff is provided with a separate username and password to enter thestudent attendance. The staff handling the particular subject is responsible tomark the attendance for all students. The attendance will be considered only if the student is present on a particular date. The student attendance report is considered based ona monthly basis andconsolidatedalong with studentmarks.

1.INTRODUCTION

The "BEC Attendance and Marks Management System" is used to manage attendance andmarks. BEC Attendance and Marks Management System allow students to view the particularsubjectattendanceandrespectiveteachertogiveattendancetothestudents.BEC Attendance and Marks Management System is an attendance maintenance system that maintainsthe proper attendance of the students along with the marks. In the existing system,the teacher requires giving attendance manually and the report is generated by analyzing all attendance books which is very time-consuming By BECAttendance and Marks Management System, report generation consumes very less time. In BEC Attendance and Marks Management System, the teacher gives attendance to each student for a particular period of time may be at day end. Attendance is sent to the HOD of a particular department as well as to the principal. After analyzing the report, HOD or principal conducts the meetings for staff by sending mail to them.

In the admin module,thecollege has to register with the system. The collegehas to add brancheswith the code number and course name. The college has to register faculty members with the respected course and department and their total personal details. The college has to add subject details in a particular branch with the syllabus. Registered faculty members areappointed to the respective branches. Registered faculty can access data and update thestudent marks and attendance. The college has to register in bulk, and then they have to segregate them as groups and allotted sections to them.

In BEC Attendance and Marks Management System, the student can only view the CIE marks, attendance activity,and SEE marks, and also the student views their profile.

2.LITERATURESURVEY

1. **Mohammad Ausaf Anwar, Durgaprasad Gangodkar**,"Designand Implementation of Mobile Phones based Attendance Marking System", Department of Computer Science Engineering,Graphic Era University,Dehradun,Uttarakhand,India,2015.

   In this paper, the architecture and design specifications of the Student Attendance Marker Application on an Android platform are presented. The authors and their team have compared both iOS and Android OSs and concluded that although IOS is more robust in virus attacks and other security threats, Android is cheaper in terms of cost and being open source enhanced .At the very first, Users/Lecturers on their device will fetch the list of students of the class for which attendance is to be recorded. They have used SQLite as a local database to store the data. For the purpose of demonstrating this application, they have used the WAMP (Windows Web Development) server using the php My Adminservice.

2. **JunLio**,"Attendance Management System using a Mobile Device and a WebApplication", Department of Socio-informatics, Faculty of Letters Chuo University 742-1Higashinakano, Hachioji-shi, Tokyo 192-0393, Japan, 2016.

   In this paper, a novel frame work for attendance management is proposed, which consists of a mobile device and a webupplication.They have adopted the combination ofa mobile device an webservices.Registonof students is passed around among participants, one by one. Users can select one from two options, registration by selfie or registration by signature. After the registration,the ID and name which have been already registered are removed from the list of participants. An application running on the mobile device is implemented as a Monaca-application.

3. **Mahesh G, Jayahari KR, Kamal Bijlani**, "A Smart Phone Integrated Smart Classroom",Amritae Learning Research Lab(AERL)Amrita School of Engineering, Amritapuri, Amrita Vishwa Vidyapeetham, Amrita University, India, 2016.

   This paper involves research and survey to identify how usage of mobile phones at education institutions can be made under the control of authorities and how 1000s of lecture hours can be saved in a year using this device. They propose a mobile application that will help in stitution authorities to control the students' mobile phones and attendance will be taken by the students themselves for saving time of taking attendance.

4. Ekta Chhatar, Heeral Chauhan, Shubham Gokhale, Sompurna Mukherjee, Prof. Nikhil Jha,"Survey on Student Attendance Management System", S.B. Jain Institute of Technology,ManagementandResearch,Nagpur,2016.

Inthispaper,thesystemdealswiththemaintenance of the student's attendance.Itgenerates the attendance of the student on thebasis of presence and absence in class. The staff will be provided with a separate username and password.

5. Md.MilonIslam,Md.KamrulHasan,MdMasumBillah,Md.ManikUddin,"Development of Smartphone-based Student Attendance System", Department of ComputerScience and Engineering Khulna University of Engineering & Technology, Khulna-9203,Bangladesh,2017.

In this paper,the system deals with the Using Smartphone like as Android Technology the course teacher will be able to take attendance easily by our designed mobile application and save the attendance in the phone as well as in server and can check percentage and also can print as hard copy. Using the stored information, this system is able to mark attendance, marking intruders' entry, attendance percentage calculations, send emails, and send SMS to the guardian to keep them updated about their child's attendance at the Institute.

6. Karwan Jacksi, Falah Ibrahim, Shahab Ali, "Student Attendance Management System",University of Zakho, Iraq, 2018.

In this paper, the system is designed in a way that candifferentiate the hours of theoretical and practice all essonssince the rate of them is different for calculating the percentages of the student's absence.

InferencedrawnfromLiteratureSurvey

Author nameand publication	Titleofthe paper	Titleofthe paper	Limitation
Mohammad AusafAnwar,DurgaprasadGangodkar	Design and Implementation Of Mobile Phones based Attendance Marking system	WAMP, SQLite	More prone to hacking or being misused by other physical attacks.
JunLio	Attendance Management Systemusinga Mobile Device And aWeb Application	Monaca application	There is no increase Of the feedback comments
MaheshG, JayahariKR,KamalBijlani	A Smart Phone Integrated Smart Classroom	Face recognition, Android	Automatic switching of profile to airplane mode in Android versions 4.1 i.e. Jelly Bean and above are restricted by Android due to security reasons
Ekta Chhatar, Heeral Chauhan,ShubhamGokhale, SompurnaMukherjee,Prof. NikhilJha	Surveyon Student Attendance Management System		Not automated

Md.MilonIslam, Md.KamrulHasan, MdMasumBillah,Md.Manik UddinKhulna	Development of Smart phone based Student Attendance System	EclipseAndroidADTbundleasIDE, SQLiteandMySQL.	Canbeusedonlyinandroid devices
Karwan Jacksi, FalahIbrahim,Shahab Ali	StudentAttendanceManagement system		Pastattendancesarenotstored

3.DESIGN AND IMPLEMENTATION

UMLDesign

The Unified Modeling Language (UML) is a standard language for specifying, visualizing,constructing, and documenting the software system and its components. It is a graphicallanguage,whichprovidesavocabularyandsetofsemanticsandrules.Itcapturesthedecisio nsandunderstandingsaboutsystemsthatmustbeconstructed.Itisusedtounderstand,design,configu re,maintain,and controlinformationaboutthesystems.

TheUMLisalanguagefor:

- Visualizing
- Specifying
- Constructing
- Documenting

Visualizing

Through UML we see or visualize an existing system and ultimately, we visualize how thesystemisgoingtobeafterimplementation.Unlesswethink,wecannotimplement.UMLhelps to visualize, how the components of the system communicate and interact witheachother.

Specifying

Specifying means building, models that are precise, unambiguous and complete UMLaddresses the specification of all the important analysis design, implementation decisions thatmustbemadeindevelopinganddeployinga software system.

Constructing

UML models can be directly connected to a variety of programming language throughmapping a model from UML to a programming language like JAVA or python or VB.ForwardEngineeringandReverse Engineeringispossible throughUML.

Documenting

The deliverables of a project apart from coding are some artifacts, which are critical incontrolling,measuringandcommunicatingaboutasystemduringitsdevelopingrequirements,architecture,desire,sourcecode,projectplans,tests,prototypesreleasers,etc.

UMLDiagram

A diagram is thegraphical presentation of aset of elements,mostoften renderedas aconnected graph of vertices and arcs. you draw diagram to visualize a system from differentperspective, so a diagram is a projection into a system In theory, a diagram may contain anycombination of things and relationships. In practice, however, a small number of commoncombinations arise, which are consistent with the five most useful views that comprise thearchitecture of a software-intensive system. For this reason, the UML includes five suchdiagrams:Usecasediagram, activitydiagram

UseCase Diagram

A use case diagram in the Unified Modeling Language (UML) is a type of behavioraldiagram defined by and created from a use-case analysis. its purpose is to present a graphicaloverview of the functionality provided by a system in terms of actors, their goals(representedas use cases),and any dependencies between those use cases. Use case diagrams are formallyincluded in two modeling languages defined by the OMG: the unified modeling language(UML)andthe systemsmodelinglanguage.

Use case diagram

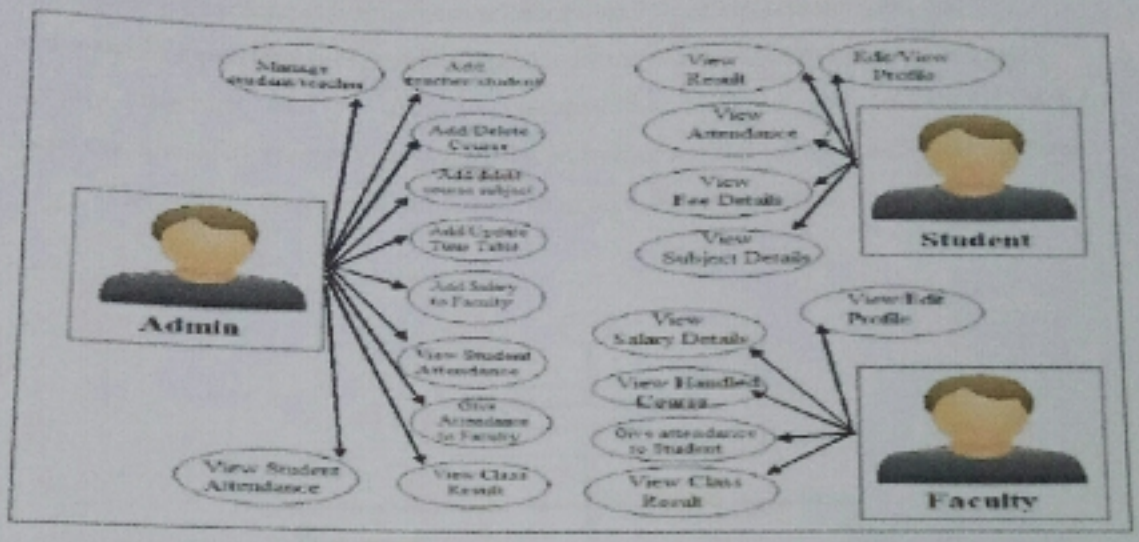

Figure 1

ActivityDiagram

Activitydiagramsaregraphicalrepresentationsofworkflowsofstepwiseactivitiesand actionswithsupportforchoice,iteration,andconcurrency.IntheUnifiedModelingLanguage, activity diagrams can be used to describe the business and operational step-by-stepworkflowsofcomponentsinasystem.Anactivitydiagramshowstheoverallflowofprocesses.

The activity diagram of our project is as shown in the figure 2.

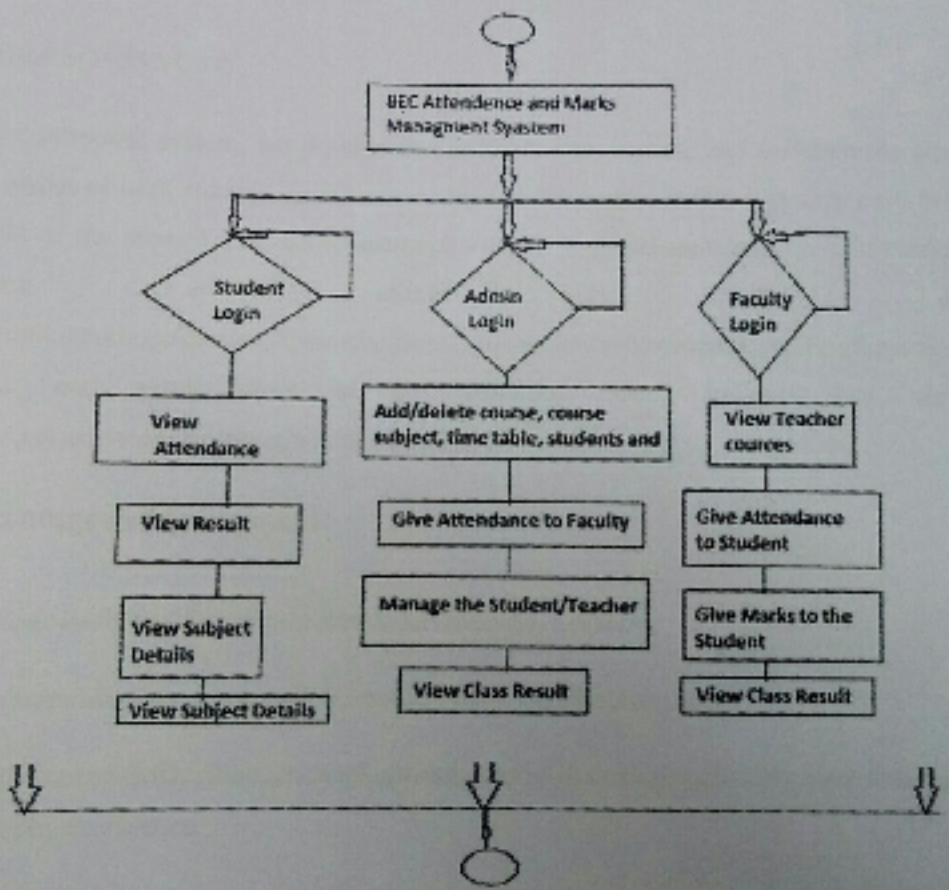

Figure 2

IMPLEMENTATION

ExistingSystem

The present existing system is a manual entry of the students. Here the attendance will be in the handwritten registers. It will be a tedious job to maintain the record for the teacher with a lot of human effort and the information retrieval is not easy as the recordsare maintained in handwritten registers. This application requires correct feed on inputintotherespectivefields. Supposethewronginputs areentered,and theapplicationresistsworking.

ProposedSystem

In our proposed system, we provide thefaculty to add, update, and maintain the attendance and marks of each student. Anotheradvantage of the system is that it is very easy to edit the details of the student and delete astudent when it is found unnecessary. The marks of the student are added in the database andimplementingthepercentagemethodtocalculatetheattendanceandalsoaddingtheassignment marks and result sheet to the software. Also, students can view the marks,attendance,resultsheet,whenevertheywant.

Advantages of our system

- User-friendlyinterface, Fastaccesstothe database, Lesserror
- The searchfacility, LookandFeelEnvironment, Quicktransaction
- Allthemanualdifficultiesinmanagingthestudentdetailsinacollegehavebeenrectifiedbyimplementingcomputerization.
- Intheproposedsystem, managethestudentmarks, attendance,and assignmentmarks.
- In this system, faculty or admin can add/delete the students, and admin adds/deletes faculty.
- Inthissystem,the admincontrolsalltheactionsandthe facultyonlymanagethestudents.Also, the students onlyview attendance,internalmarks,assignmentmarks,etc.

4.METHODLOGY

AdminModule

This isthefirstandthebasicmoduleoftheproject.Inthis module, theproject isprovidedtothe admin to manage the faculty and student module. An admin has the authority to add andremove the faculty, Add and delete the Notification, view the progress and attendance status ofthe students,updatethe academiccalendaretc.

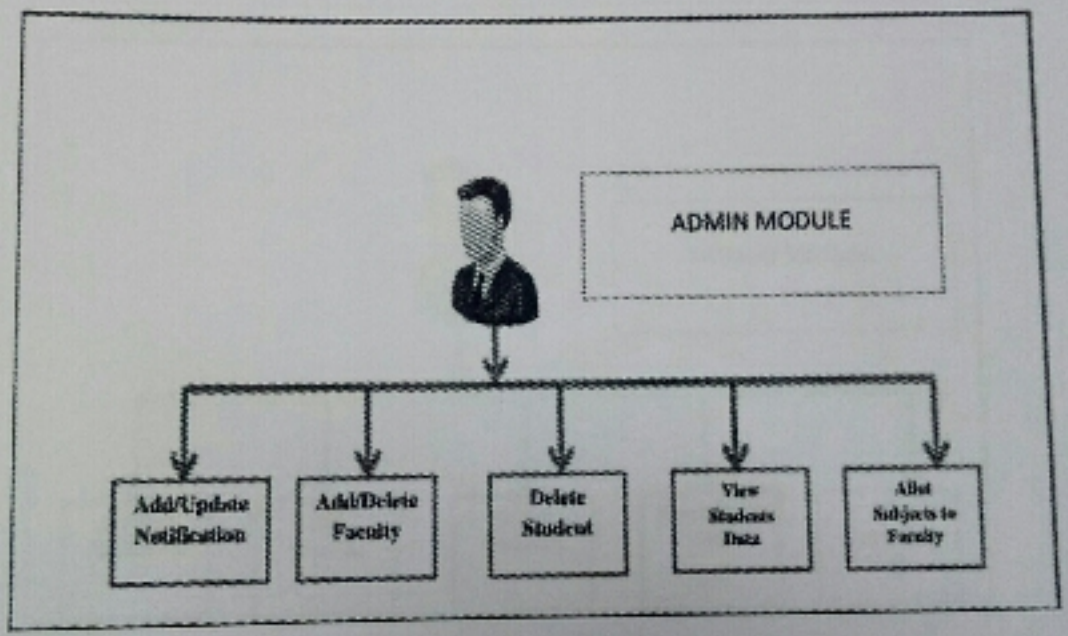

Figure 3

FacultyModule

This module is for the faculty members of the institute.All faculty get a unique idnumber and a pin for registration by the administrator of the institute.By using the registrationid and pin, the faculty will get the registration page, after filling that form the faculty will get registered in the institute database and they choose a password for login to their profile. After login, the faculty are authorized to service the students like submit attendance, submit marks of their subjects, make result, add notification for a particular department, send mail to individual or a group of students, allot assignments and project to thestudents.

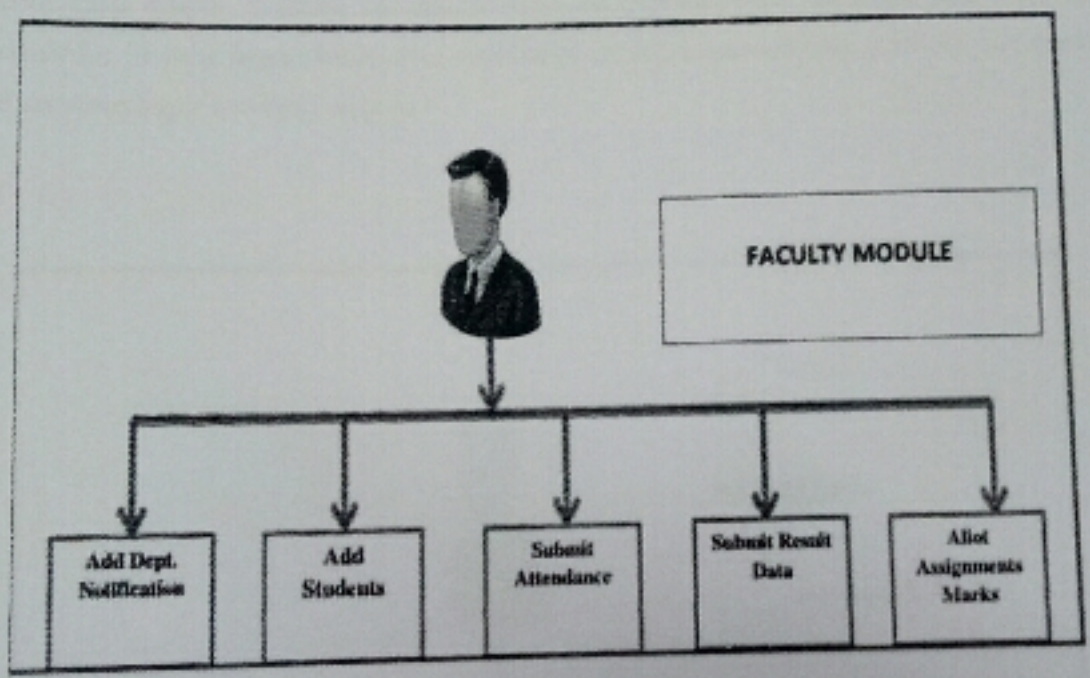

Figure 4

StudentModule

Like faculty registration ,the student gets a registration number and a pin on registering themselves. After entering the reg number and pin, students are redirected to the registration page. After submitting their general details, student will get a registration number and a password to logintheir profile. After login, the student is able to view and update their informationlike mobile number, email, address and profile pictures but students are restricted to updatetheir key details like Name, Father Name, Date of birth. In case the student wishes to make important changes, he/she must write an online application to their HoD for approval to update these details. Students are able to view other information related to their class like notification of their departments, own attendance in individual subjects, previous test marks, and send messages too there student.

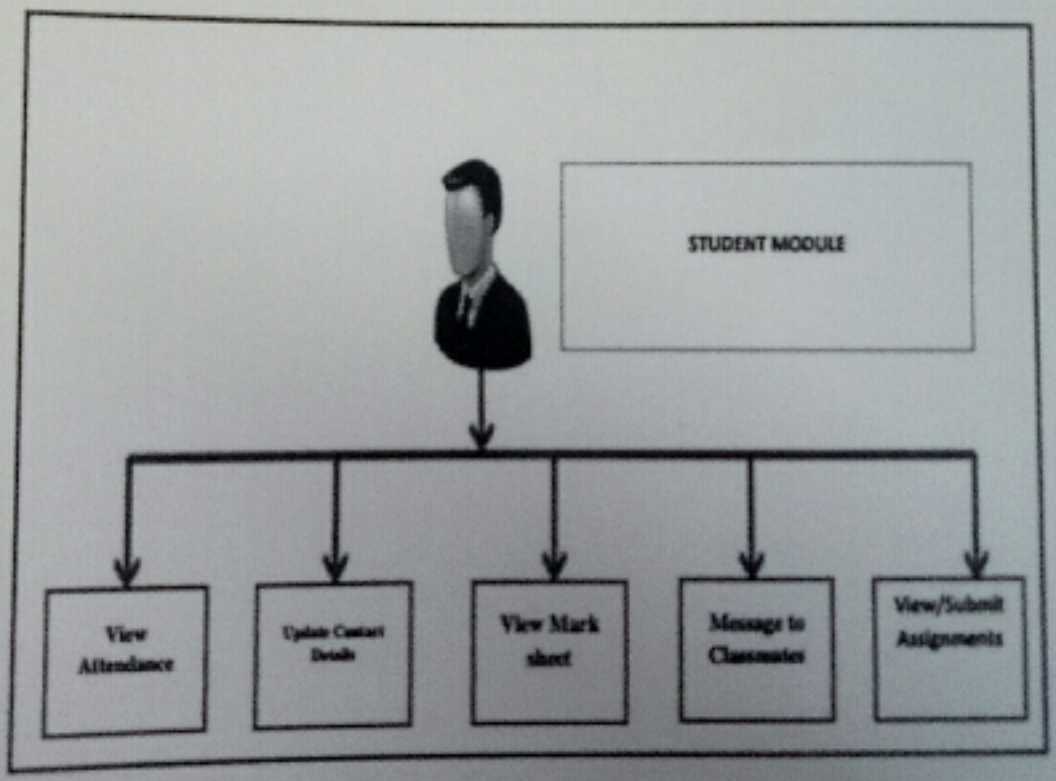

Figure 5

5.HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirements

1. I3 Processor Based Computer or higher
2. Memory: 1 GB RAM
3. Hard Drive: 50 GB
4. Monitor

Software Requirements

1. Windows 7 or higher
2. IDE Visual studio code
3. Wamp server
4. MySQL database

6.RESULTSANDDISCUSSION

Snapshots

Figure 6. Home page

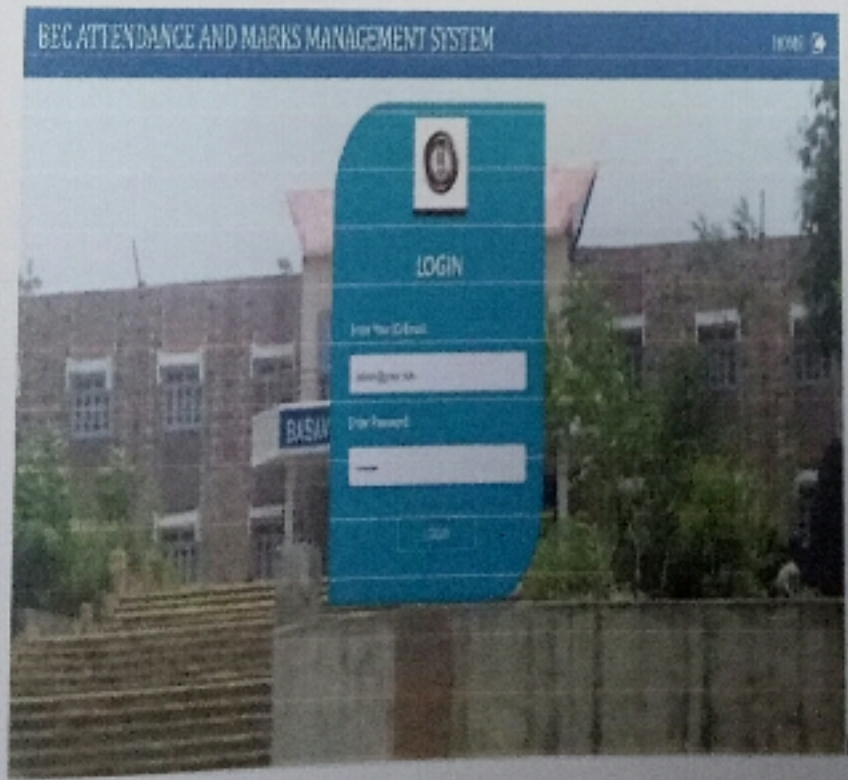

Figure 7. Login page

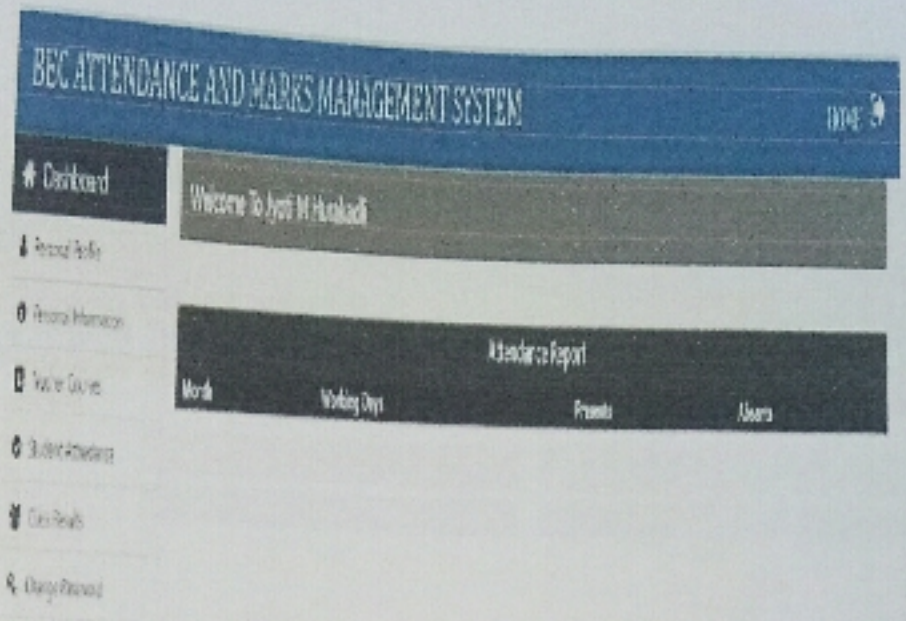

Figure 9. Faculty page

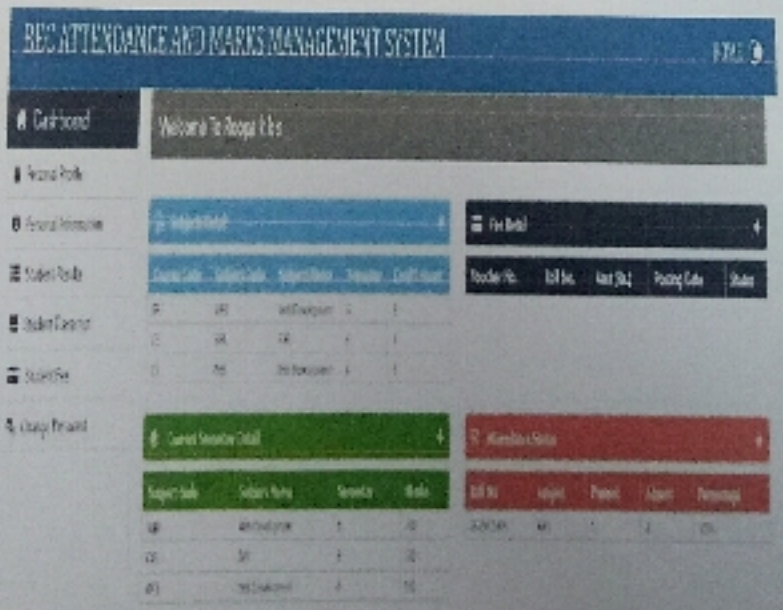

Figure 10. Student page

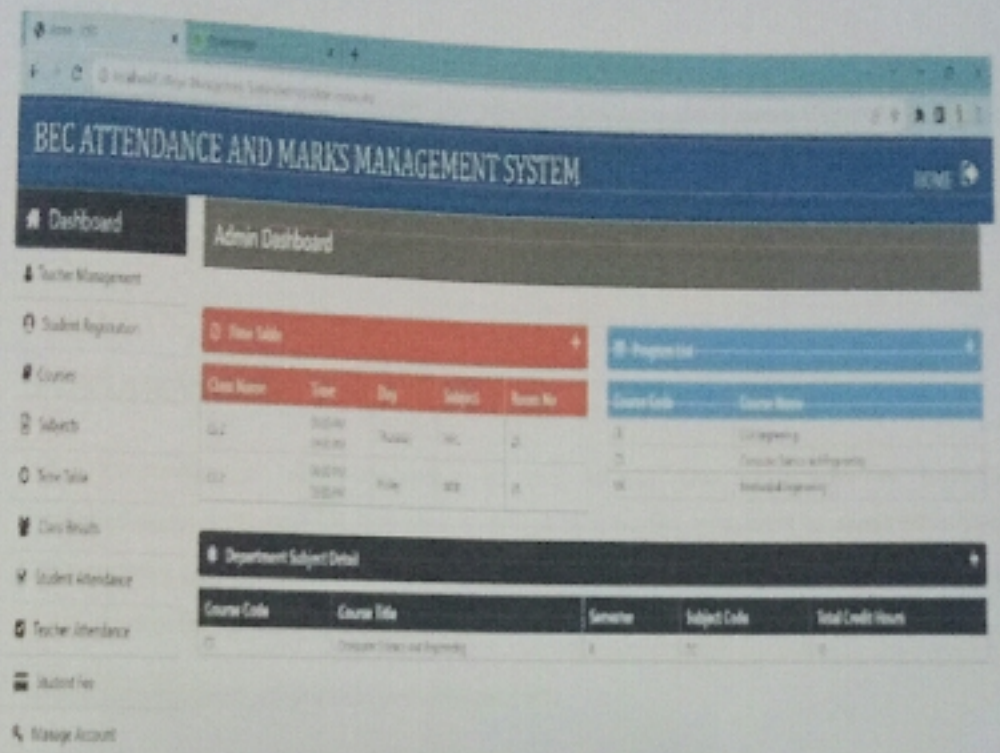

Figure 8. Admin page

7.CONCLUSIONANDFUTUREWORK

CONCLUSION

Toconclude, theBEC Attendance and Marks Management Systemfully meets the objectives of the college. The system has reached a steady state where all bugshavebeeneliminated.The systemisoperatedat ahighlevelofefficiencyand the teachersand user associated with the system understands its advantage. The system solves theproblem.

FUTUREWORK

The projecthas a very vastscope in the future. The projectcan be implemented in othercolleges with extra technologies. It can also be implemented in some otherinstitutes too. The project can be updated in the near future as and when a requirement for the samearises, as it is very flexible in terms of expansion.

Thefollowingarethefuturescopefortheproject:

1. Free approach to enter attendance.
2. Attendance management system can be accessed through mobile devices.
3. Highly Reliable and Better user Interface.

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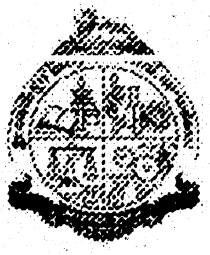
B.V.V. SANGHA'S

BASAVESHWAR ENGINEERING COLLEGE (AUTONOMOUS), BAGALKOT

AFFILIATED TO

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI



2021-2022

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

MAJOR PROJECT REPORT

SUBJECT CODE: UCS852P

"VIRTUAL TOURIST GUIDE"

UNDER THE GUIDANCE OF

DR. V. B. PAGI

PROFESSOR AND HEAD OF THE DEPARTMENT CSE

PROJECT ASSOCIATES

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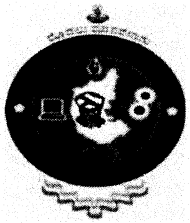

A PROJECT REPORT

ON

VIRTUAL TOURIST GUIDE

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

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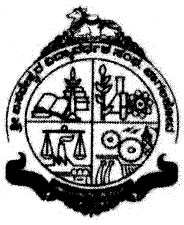

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ASAVESHWAR ENGINEERIN COLLEGE(AUTONOMOUS)

BAGALKOT-587 102

2021 - 22

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

B. V. V. Sangha's

veshwar Engineering College (Autonomous) Bagalkot – 587 102

PARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

his is to certify that the project work entitled "VIRTUAL TOURIST UIDE" is a bonafide work carried out by **Abhishek Batakurki BA18CS001), Nikhil Vithal Ghorpade (2BA18CS035), Pradyumna avadatti (2BA18CS041)** and **Vivek Halakatti (2BA18CS081),** in artial fulfillment for the award of **Bachelor of Engineering** in **Computer cience and Engineering** of the **Visvesvaraya Technological University,** elagavi, during the year 2021 - 22.

Signature of the Guide & HOD	Signature of the Project Coordinator	Signature of the Principal
Dr. V. B. Pagi	**Prof. Smitha Gour**	**Dr. S. S. Injaganeri**

External Viva

Name of the Examiners:	**Signature with Date:**
1. Smita Gour	6/8/22
2. S. R. Kajol	6/8/22
3. Dr. L B. Bhajantri	6/8/22

DECLARATION

We, **Abhishek Batakurki** (2BA18CS001), **Nikhil Vithal Ghorpade** (2BA18CS035), **Pradyumna Savadatti** (2BA18CS041), **Vivek Halakatti** (2BA18CS081) students of 8th semester BE in Computer Science and Engineering, Basaveshwar Engineering College Bagalkot, hereby declare that the project work entitled "**VIRTUAL TOURIST GUIDE**" submitted to the **Visvesvaraya Technological University** during the academic year 2020-21, is a record of an original work done by us under the guidance of **Dr. V. B. Pagi**, Head of the Department, Department of Computer Science and Engineering, Basaveshwar Engineering College, Bagalkot. This project work is submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Engineering in Computer Science and Engineering. The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree.

Date:

Place: Bagalkot

Abhishek Batakurki

Nikhil Vithal Ghorpade

Pradyumna Savadatti

Vivek Halakatti

ACKNOWLEDGMENT

It is with the greatest pleasure and pride that we present this report before you. At this moment of triumph, it would be unfair to neglect all those who helped us in the successful completion of this project work. Many people supported our work both within and outside, and hereby we wish to express our sincere thanks to one and all.

First, we would like to thank our project guide and Head of the Department **Dr. V. B. Pagi** for his guidance and wholehearted support and very valued constructive criticism that has driven us to complete the project work successfully. The hard-working nature, constant perseverance, commitment to task and ignition to talent have impressed us a lot.

We wish to express my sincere thanks to Project Coordinator **Prof. Smitha Gour** for her involvement, timely suggestions throughout the course of our project work. We would also like to remember our beloved Principal, **Dr. S. S. Injaganeri** for his constant encouragement and support during the project work.

We also express our heartiest gratitude to all faculty members and staff of the Computer Science and Engineering department for all the suggestions and support provided during this project work. The good wishes of our Parents are also greatly remembered. We would take this opportunity to thank our friends.

We feel words are not adequate to express gratitude to all our teachers, friends, and family members. Lastly, we thank all those who directly or indirectly helped us to successfully complete this project work.

Abhishek Batakurki

Nikhil Vithal Ghorpade

Pradyumna Savadatti

Vivek Halakatti

ABSTRACT

Traveling is a very important part of life. Tourism in India is important for the country's economy and is growing rapidly. The sector is predicted to grow at an annual rate of 6.9% to rupees 32.05 lakh crore(US$460 billion) by 2028 (9.9% of GDP).

This AI-aided web-based application will provide a tailor-made experience, offering a personalized answer and suitable options based on the places they visited. It will also provide a planned route or journey. This Application acts as a tourist planner which focuses on local flora and fauna. It also acts as a virtual travel agent which shares suggestions based on user travel preferences. The old-fashioned concept of showcasing only India's historical heritage and monuments is changing and people around the world are more interested in ecotourism where they want to see the local flora and fauna.

This application uses Reactjs for frontend development and firebase for database management. The IDE used for building this project is Microsoft Visual Studio. This project recognizes the local places and suggests them to the tourists. The tourists also get information about the places they are visiting. This web-based application can be accessed anywhere.

Highlights of the proposed project

- Local / less known places
- Customized tourist guidance
- Customized Food and Accommodation
- Nearby places

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1.2 MOTIVATION

As information is the lifeblood of the travel industry, effective use of technology is fundamental to the tourism sector. In this new era of digital technology, there is a need for the tourism industry to evolve from the traditional way of operation to the digital way of management. With the effective use of computer technology, a computerized tourism system can increase the effectiveness of information management. The information available on the internet is vast, and it can be filtered and presented in a simple way so the accessing of data becomes easy.

1.3 APPLICATIONS

- Recognition and improvement to Local Places.
- By using this application, the user can get a visualization of the place before the visit.
- The proposed system requires no human guide for tourist spots.
- Helps tourists to get details about seasonal places.
- Helps the user to explore the place by showing all the information about the places.
- Customized tourist guide, appropriate to the interest of the tourist.
- Web-based applications can be accessed anywhere on the internet.
- Eliminates and replaces the Tourist guide.

2. LITERATURE SURVEY

A brief review of the related literature is presented in this section. The review highlights the contributions of various authors in related work. The review also attempts to bring out related issues and challenges and limitations in existing mechanisms.

Tourism is travel for pleasure and also the business process. Tourism is one of the most important and fastest-growing industries [1]. In the survey of 2019 around 39 crores domestic and 61 lakh, foreign tourists visited Tourist places in Tamil Nadu. And there are around 55 tourist places in and around Tamil Nadu. But there are only a few Tourist guides in Tamil Nadu. The main goal of that project was to help the tourists to know all the information about the particular tourist places and take full advantage of the visit without missing the main information and history. To guide tourists with respect to visiting, there exist numerous applications that are paper-based and Mobile based, having restrictions of interactive visualization. By considering restrictions of other applications, that system application provides a portable tour guide application with increased augmented information to replace the traditional tour guide booklet. The application was developed based on the Android platform with augmented reality technology, and delivered as a mobile application.

The amount of information available on the internet and its number of users have experienced a huge increase in the past decade [2]. However, the list of possibilities offered by web search engines or even specialized tourism sites may be vast. The growth of this long list of options is very complex and time-consuming for tourists to select the one that fits better with their needs. The project objective was to design an intelligent AI-Based Tourist Guide system algorithm. In such a way that it will eliminate the middleman that is a tourist guide and make the working Application which contains a task which can be covered by a single guide and each individual can arrange their own trip independently.

Due to the rapid increase in the demand for information that supports tourists after, before, and during the trip, many tour systems are available [3]. However, these systems are not able to successfully replace a human facilitator that is expensive to hire. The primary key qualities of a human tourist guide are his/her knowledge, communication skills, and interpretation of destination attractions. Traditional tourist facilitator systems are lacking in these qualities. The main idea of the research was to design an agent to guide tourists, provide them accurate

Information about visitable places, without having any bound for a specific region and it would have human-like communication skills along with the point of interest knowledge, which depends on its internal knowledge base as well as its online searching techniques.

The collaborative filtering (CF) technique has been widely utilized in recommendation systems due to the precise prediction of users interests [4]. Most prior CF methods adapted overall ratings to make predictions by collecting preference information from other users. However, in real applications, people's preferences usually vary with time; the traditional CF could not properly reveal the change in users interests. In this paper, the authors proposed a novel CF-based recommendation, dynamic decay collaborative filtering (DDCF), which captures the preference variations of users and includes the concept of dynamic time decay. They extend the idea of human brain memory to specify the level of users interests (i.e., instantaneous, short-term, or long-term). According to different interest levels, DDCF dynamically tunes the decay function based on users behaviors. The experimental results show that DDCF with the integration of the dynamic decay concept performs better than traditional CF. In addition, they conducted experiments on real-world datasets to demonstrate the practicability of the proposed DDCF.

Artificial intelligence (AI) is currently present in almost every area of travel and tourism, appearing in different types of applications such as personalization and recommender systems, robots, conversational systems, smart travel agents, prediction and forecasting systems, language translation applications, and voice recognition and natural language processing systems [5]. Recent improvements in big data, algorithms, and computing power have enabled significant enhancements in AI. They reviewed how AI has changed and is changing the main processes in the tourism industry. They started with the IT foundations of AI that are relevant for travel and tourism and then address the AI systems and applications available in the sector. They then examine hospitality in detail, as a sector in which most of these systems are being implemented. They concluded with the challenges that AI faces in the tourism sector, a research agenda, and draw a scenario of the future of AI in tourism.

The paper presents an interactive electronic guide application prototype able to recommend personalized multiple-day tourist itineraries to mobile web users [6]. This relies on an evolutionary optimizer that allows the determination, in an acceptable time, of a near-optimal user-adapted tour for each day of the visit by considering different conflicting objectives. The

tour optimizer automatically plans the itinerary by selecting the sights of potential interest based on user preferences, the available visit time considered on a daily basis, opening days and hours, visiting times, accessibility of the places of interest and weather forecasting. The interactive functionalities and facilities provided by the application are illustrated, along with the model used to adapt the tour itinerary to user preferences and constraints. An experimental qualitative and quantitative evaluation was performed to assess the validity of the guide prototype. Particular attention was devoted to the usability of the application and its graphic unit interface, along with user satisfaction.

The evaluations of the current adoption level show the potential impact of artificial intelligence systems in the travel and tourism industry [7]. The focus of their work lies on current AI applications such as chatbots or robots and their usage along the traveler's journey. The evaluation of the current adoption is based on a collection of use cases. The impact evaluation is based on expert discussions and opinions. In both cases, the results of third-party studies are also included. The purpose of the work was to give the management and owners guidance on how to handle artificial intelligence in their travel and tourism business.

Smart tourism has become increasingly popular in mainland China [8]. Different types of events and activities have been classified as smart tourism, leading to the misuse of the term. The definition provided by this study emphasizes smart tourism as an individual tourist support system within the context of information services and an all-encompassing technology. This compares the characteristics of both traditional tourist information services and those incorporated in smart tourism. Based on the concepts, recommendations are provided and future research/industrial directions are discussed. For the Chinese tourism market, smart tourism represents a new direction implying a significant influence on tourist destinations, enterprises, and also tourists themselves.

A three-dimensional digital tourism presentation system (3D-DTPS) is a crucial part of digital tourism [9]. As a relatively mature digital earth software and platform, Google Earth (GE) has been widely used in various fields, including digital tourism. Especially the release of GE Plug-in and API makes it possible to build sophisticated 3D web map applications which are just like 3D-DTPS. This paper expounded the development and implementation of 3D digital map web applications based on GE API, which mainly includes 3D scene modeling and main functions implementation, the former is realized by overlaying different professional

geospatial data such as HD remote sensing images, the matic vector data, 3D models, tours data to GE and then exporting to KML files, the latter mainly include 3D scene loading, query and location and flight tour. And the result shows that building 3D-DTPS based on the GE API is effective because it can not only make full use of the advantages of GE resources and technologies, but also can easily integrate professional data and functions to build sophisticated 3D web map applications.

The developing tourist industry proposes higher and higher demands to the intelligent tourist guide system, which can take the place of the traditional artificial guide service [10]. Functions of intelligent automatic interpretation, real-time navigation, intelligent route planning and surrounding service reminder are included in it. With the rapid development of electronic information technology and computer technology as the support, the combined with the shortest path algorithm and related knowledge of graph theory to design algorithms and processing schemes. Moreover, this also introduces the research design of intelligent tourist systems as well. Thus, the function of the APP on the android platform is realized.

The problem of deriving personalized recommendations for daily sightseeing itineraries for tourists visiting any destination [11]. Their approach considers selected places of interest that a traveler would potentially wish to visit and derives a near-optimal itinerary for each day of visit; the places of potential interest are selected based on stated or implied user preferences. This method enabled the planning of customized daily personalized tourist itineraries considering user preferences, time available for visiting sights on a daily basis, opening days of sight and average visiting times for these sights. They propose a heuristic solution to this problem addressed to both web and mobile users. Evaluation results verify the competence of our approach against an alternative method.

Nowadays, time is considered as valuable as gold. Once time is used sensibly, access to a lot of information is possible [12]. People who want to go sightseeing in different places as tourists may need to have some information about those places. Determining the shortest routes to the historical places and natural beauties from their accommodation will be both time saving and economical. Geographical Information System (GIS) technologies provide us with these possibilities. In this study, GIS design and network analysis were carried out by taking advantage of GIS possibilities for tourism.

The prototype implemented included basic functionalities of city guide such as showing a map, locating points of interest (POIs) on a map, locating the location of a user, retrieving information of POIs, adding reviews about POIs, planning a tour, supporting communication (e.g. phone, short message), show route direction to POIs, add a reminder, and choose different kinds of POIs to show on the map [13]. Moreover, this had explored how to integrate current technologies like Google Calendar, Google Map, Browser, Contact application and Phone application into the prototype.

The problem of deriving personalized recommendations for daily sightseeing itineraries for tourists visiting any destination [14]. Their approach considers selected places of interest that a traveler would potentially wish to visit and derives a near-optimal itinerary for each day of the visit; the places of potential interest are selected based on stated or implied user preferences. They proposed a heuristic solution to this problem and discussed its implementation aspects.

Title	Publication Year	Author	Findings
Virtual Tourist Guide	2021	Harini, Ashmitha, Deepan Raj K, Janani S R	Aims to help the tourist to know more information about the visited place.
AI-Based Tourist Guide	2021	Kewal Rathod, Vinay Govekar, Mayuri, Gaikwad, Ichnanshu Jaiswal	it will completely eliminate the middleman that is tourist guide
The Use of Machine Learning Algorithms in Recommender Systems: A Systematic Review	2021	lens Portugal, Paulo Alencar, Donald Cowan	presents a systematic review of the literature that analyzes the use of machine learning algorithms
Design and development of AI-Based Tourist Facilitator and Information Agent	2020	Adeel Munawar Syed, Ali Raza Awais Qasim	idea of the research is to design an agent to Raza Awais Qasim guide tourists,

			provide them accurate information about visitable places.
System for Intelligent Tourist Information Techniques	2018	Sai Ganga, Chandra Prakash Reddy, Chandra mohan	System learns based on user's input and provides personalized and customized suggestions,
Research Design of Intelligent Tourist Guide System and Development of App	2015	Kaijian Huang and Junwu Zhu	Development of Shortest path algorithm
A Model for Intelligent Tourism Guide System	2011	H. Owaied, H. A. Farhan	Knowledge-based system which studies human behaviour as tourism guide.
Development of three dimensional digital tourism presentation system based on Google Earth API	2011	Haifeng Huang Wei, Liu	Google Earth API is used to represent the map in 3D web map applications

2.1 Literature Survey Table

2.1 RESEARCH GAPS IDENTIFIED

From the literature review carried out, we have found out some of the following issues that might be addressed.

2.1.1 ISSUES

- **Food recommendations are not provided**:- In many websites there are only recommendations of good and famous hotels, but they are not specifically attached to any local foods. They are providing every kind of food, whether it's tasty or not. To avoid that and to promote local food, we need to provide recommendations for local food.

- **Planned location suggestions not provided**:- Usually, when someone visits a location they might not know where to go next as the place they visit may be completely new to them. To counter this problem, VTG provides a recommendation of the next place to be visited by the tourist if they are interested in doing so.
- **Seasonal place locations are not provided**:- There are always places that light up in some specific seasons that one might not know of. To make these kinds of places known to people, there is a separate section for seasonal places too. Places like falls sometimes occur only during the rainy season, such places are highlighted here so that those places should not be missed during the right time.
- **Not focusing on popular locality places**:- People usually travel to place less known to them to explore nature or other beautiful things like culture, environment, tradition. These are always placed popular in that specific region, which is known only by the people who stay there. Hence, these places can also be added to VTG and make this known to tourists from elsewhere.
- **Unavailability of tourist guides in some destinations**:- Famous places like Badami and Aihole are provided with many tourist guides but as in times like Covid-19 many tourists will try to avoid them because of health issues. In many local places, there are no tourist guides, so to overcome that problem we need a virtual tourist guide.
- **There is no proper way of promoting local tourism**:- There are many places that are missed by the tourists that they must see. And there are also people who have missed some places in their own locality in which they live. So this problem can also be resolved by promoting local tourism and by listing places which are worth visiting at least once that fall among their locality.
- **Non-availability of correct directions to reach the local places and explore them properly**:- Sometimes knowing the place is not enough, you need to navigate to it. There are instances where you keep asking localities for the path to the place, and it might be likely during daytime and to tackle this VTG has directions to all the places that are listed on it. Hence, finding a route will be one less hassle to go.

1.2 CHALLENGES

- **Finding the nearby locations by calculating longitude and latitude:-** For our project, it's really hard to find nearby famous places and recommend them to other nearby locations from that local place. Recommending the tourist to go from one local place to another local place.
- **Locating less known places:-** One of the bigger tasks is to find the local places and search them. Asking the local people about the places that are good for traveling. Sometimes the locations are hard to reach and only a few times we can reach there.
- **Hard to choose the algorithm:-** On the internet there are a lot of recommendation algorithms. To choose one of the algorithms and to select which algorithm suits our project more will be a difficult task for our project.

3. PROBLEM DEFINITION

Information available on the internet may particularly be useful or necessary for those users who wish to plan for visiting local destinations. However, the list of possibilities offered by web search engines or even specialized tourism sites may be vast. Only a few places have tourist guides, but they provide costly services. The growth of this long list of options is very complex and time-consuming for tourists in order to select the one that fits better with their needs. There is no proper method for the promotion of local tourism. Lack of availability of details about local food and accommodations.

3.1 PROPOSED SOLUTION

The proposed model mimics the human tourism guide, through building relationships between knowledge based-system with the role of tourist-guide, as a means to provide a professional service for any visitor which best meet his needs and desire of gaining sufficient information and objective understanding of the places visited together with better value and satisfaction of his tour. We are providing a web application with a simple user interface that provides better search results. We are providing all in one information about the local food, accommodation and history information about the tourist places. Details about each and every place are provided with images and information. The website is a mobile compatibility application that can be accessed anywhere and provides the user with map details. Users will be provided with seasonal guidance like which place is better according to season-wise. Sharing locations of local foods and accommodations, which are easily accessed using our web application.

3.2 OBJECTIVES

- The aim to design and develop the project is to produce a tourist guide for Bagalkot district, the web application is to be user-friendly tourist guide over any operating system for Bagalkot district which is not available currently for smartphones. Due to domestic and international tourist flow in Bagalkot district, such applications are helpful for the tourists. Nowadays, people prefer to use web applications due to easy, conveyance usage.
- To change the traditional techniques of human guides by using printed maps and written information. The traditional technique might create problems while decision-making due to lack of information or guidance. The application serves as a virtual guide to facilitate a tourist with interactive Google Maps.
- To provide basic information and history about the tourist spots.
- To facilitate the tourism industry by using modern technologies to boost tourism.
- To provide a customized experience to users.

4. PROPOSED METHODOLOGY

After a thorough analysis of Tourism problems and its solutions, the approach to the software development is designed as shown in the below figures.

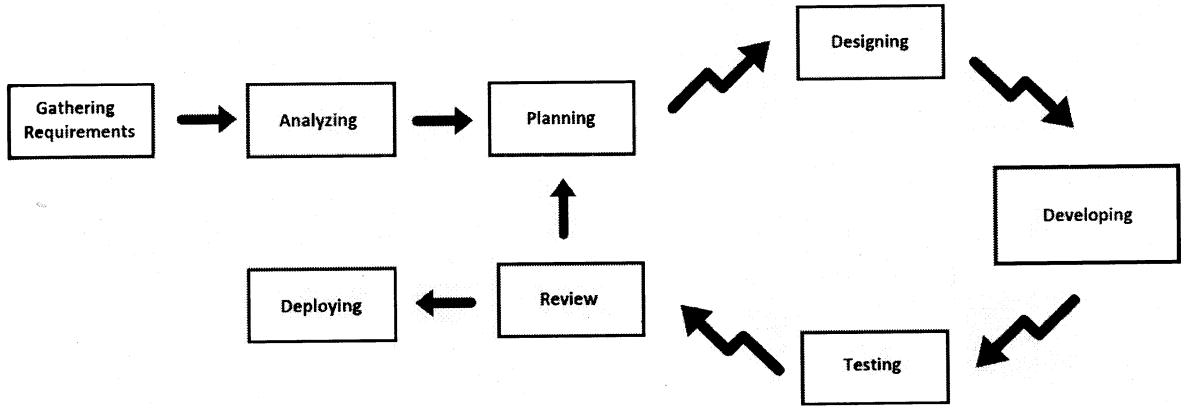


Fig. 4.1 Software Development Cycle

Gathering requirements: Gathering requirements for the project is the most important part of the SDLC for project managers and internal stakeholders of a project. During this phase, the customer states the expectations of the project including who will use the product, how the customer will use the product, and the specific information included with any special customer requirements related to the software. The customer meets with business managers and analysts to provide the requirements. It's important for the project team to understand the needs of the customer because this information is critical to developing the product the customer requests.

Analyzing: After the customer provides requirements for the product, the project manager and members of the project team begin to analyze the requirements. The business managers analyze each requirement to ensure the requirement can be included in the software without causing breaks or problems with system functionality.

Planning: The information of the requirements and analysis is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas. Planning for the quality assurance requirements and identification of the risks associated with the project is also done in the planning stage. The outcome of the technical feasibility study is to define the various technical approaches that can be followed to implement the project successfully with minimum risks.

Designing: In SDLC, the design phase is a stage where software developers define the technical details of the product. Depending on the project, these details can include screen designs, databases, sketches, system interfaces, and prototypes. Clients use these details to make final product design choices. For convenience, all details are compiled in a Software Requirement Specification (SRS) document. The SRS has requirements, standards, and expectations for the future product that the client approves before any development can start.

Developing: In this stage of SDLC, the actual development starts and the product is built. The programming code is generated as per DDS during this stage. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle. Developers must follow the coding guidelines defined by their organization and programming tools like compilers, interpreters, debuggers, etc. are used to generate the code. Different high level programming languages such as C, C++, Pascal, Java and PHP are used for coding. The programming language is chosen with respect to the type of software being developed.

Testing: The phase entails the evaluation of the created software. The testing team evaluates the developed product(s) in order to assess whether they meet the requirements specified in the 'planning' phase. Assessments entail the performance of functional testing: unit testing, code quality testing, integration testing, system testing, security testing, performance testing and acceptance testing, as well as nonfunctional testing. If a defect is identified, developers are notified. Validated (actual) defects are resolved, and a new version of the software is produced.

Review: In this phase, various elements of the software are monitored. These could include the overall system performance, user experience, new security vulnerabilities, an analysis of bugs or errors in the system.

Deployment: In the deployment phase, the application is made available to users. Many companies prefer to automate the deployment phase. This can be as simple as a payment portal and download link on the company website. It could also be downloading an application on a smartphone.

Deployment can also be complex. Upgrading a company-wide database to a newly-developed application is one example. Because there are several other systems used by the database, integrating the upgrade can take more time and effort.

4.1 ARCHITECTURE

The most popular multilayer architecture is the three-layer architecture. This three-layer architecture is important for designing or creating mobile app architecture. It refers to your component's internal architecture. The given are the main three important layers of mobile architecture design:

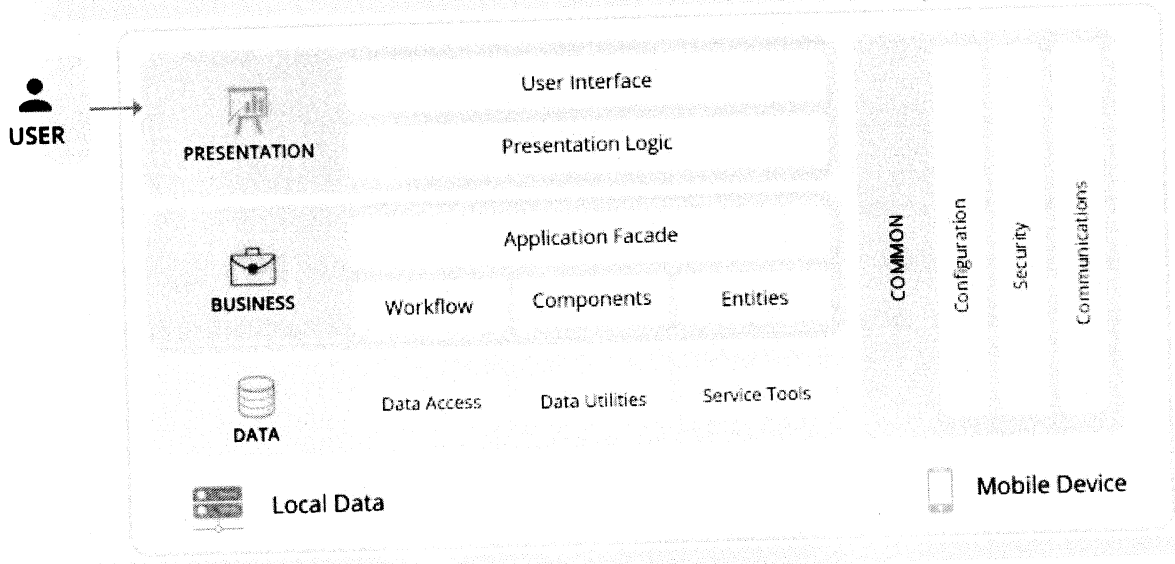


Fig. 4.2 Architecture

Presentation Layer: The presentation layer consists of two components. These two components include the User Interface and UI process. While discussing this layer, the primary focus is the end user's mobile application's presentation. The mobile application developers should look for a client type. So, it would be compliant with the infrastructure.

During the presentation layer stage, you need to decide on many important things. These

include themes, fonts, colours and shadings. The developer should keep in mind the client's deployment restriction while mobile app architecture designs. Another important necessity of this layer is to select the correct data format. Then use robust data validation mechanisms.

Business Layer: The business layer is for the elements on the business front. This layer looks at how the app will present the business to the end-users. This layer includes business components, workflow, and entities. These layers' complexity is more complex than others. It concerns too many problems such as caching and logging. The exception management and security challenges also add to its complexity.

There are two parts of this layer to reduce the complexity. These include the service layer and domain model. The service layers are for common application function sets. While the domain model is for knowledge and expertise linked to specific problems.

Data Access Layer: The data access layers are to meet the application needs. They offer efficient and secure data transactions. For this purpose, a developer needs to design this layer. It combines different parts including data utilities, data access components, and service agents.

The selection of the correct data format is important. Also, having a strong validation technique is another factor that makes it important to design this layer. Mobile app developers should consider the maintenance of the data. This practice helps in keeping this layer changeable with the business requirements.

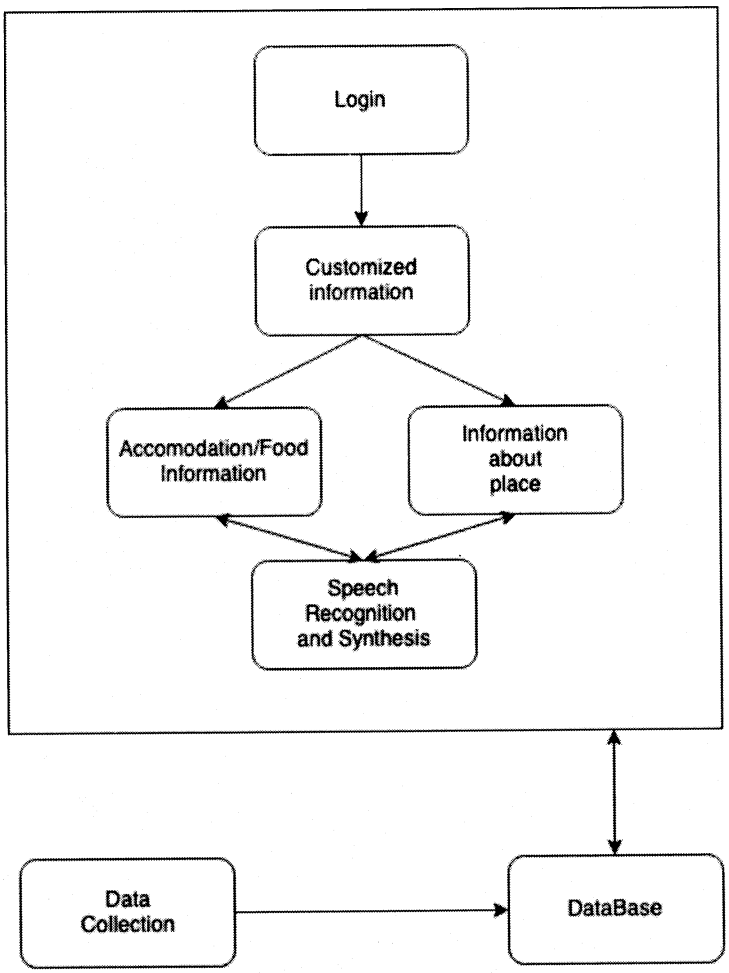


Fig. 4.3 Block diagram

- **Data collection:** Initially all the data about the tourist places is collected. Data is collected from various sources and the collected data will be prepared and stored in the database.
- **Database:** The database will be built with Firebase which is NO SQL, Backend as a Service by Google.
- **Customized Information:** This webpage includes customized information to the user. This will include the results from the trained model and data from the database.
- **Speech Recognition and Synthesis:** This model is for the two-way interaction between the user and the interface through the voice.
- The frontend will be implemented using React.js which is a JavaScript library by Facebook.
- Users can access the website through any web browser.

5. SYSTEM DESIGN

The Proposed system has been developed in a very accessible way using some of the open-source tools and techniques. The project consists of many modules like Packages used in reactjs, hooks that bind our project modules. Pseudocode for some of the core modules is also described.

5.1 TOOLS USED

To build this project, these are the following tools of software that are necessary. Altogether they are a combination of front-end and back-end, also they include IDE that has been used to build this project.

React.js:

React is a free and open-source front-end JavaScript library for building user interfaces based on UI components. It is maintained by Meta and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications.

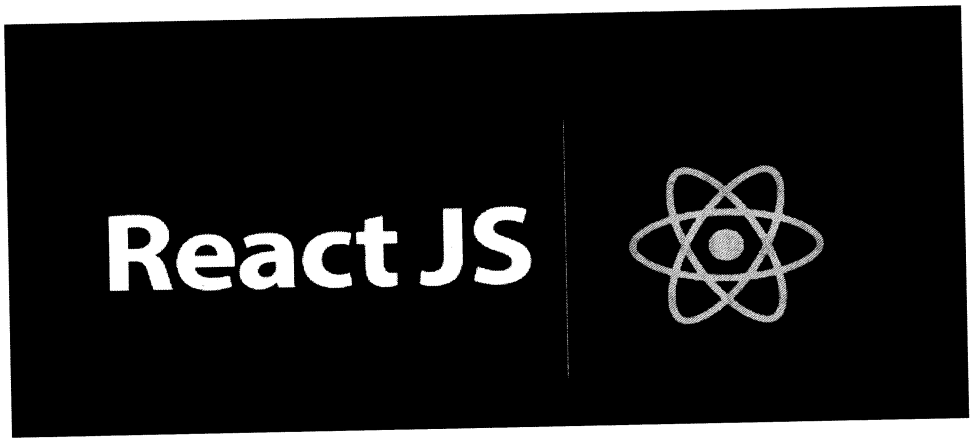


Fig. 5.1 React.js

Declarative: React makes it painless to create interactive UIs. Design simple views for each state in your application, and React will efficiently update and render just the right components when your data changes. Declarative views make your code more predictable and easier to debug.

Component-Based: Build encapsulated components that manage their own state, then compose them to make complex UIs. Since component logic is written in JavaScript instead

of templates, you can easily pass rich data through your app and keep the state out of the DOM.

React hooks: Hooks are functions that let developers "hook into" React state and lifecycle features from function components. Hooks do not work inside classes — they let you use React without classes.

React provides a few built-in hooks like useState, useContext, useReducer, useMemo and useEffect. Others are documented in the Hooks API Reference. useState and useEffect, which are the most commonly used, are for controlling state and side effects respectively.

Unidirectional data flow: To support React's concept of unidirectional data flow (which might be contrasted with AngularJS's bidirectional flow), the Flux architecture was developed as an alternative to the popular model–view–controller architecture. Flux features actions which are sent through a central dispatcher to a store, and changes to the store are propagated back to the view. When used with React, this propagation is accomplished through component properties. Since its conception, Flux has been superseded by libraries such as Redux and MobX.

Flux can be considered a variant of the observer pattern. A React component under the Flux architecture should not directly modify any props passed to it, but should be passed callback functions that create actions which are sent by the dispatcher to modify the store. The action is an object whose responsibility is to describe what has taken place: for example, an action describing one user "following" another might contain a user id, a target user id, and the type USER_FOLLOWED_ANOTHER_USER. The stores, which can be thought of as models, can alter themselves in response to actions received from the dispatcher.

This pattern is sometimes expressed as "properties flow down, actions flow up". Many implementations of Flux have been created since its inception, perhaps the most well-known being Redux, which features a single store, often called a single source of truth.

React does not attempt to provide a complete "application library". It is designed specifically for building user interfaces, and therefore does not include many of the tools some developers might consider necessary to build an application. This allows the choice of whichever libraries the developer prefers to accomplish tasks such as performing network access or local data storage. Common patterns of usage have emerged as the library matures.

al Studio Code:

al Studio Code is a source-code editor made by Microsoft for Windows, Linux and OS. Features include support for debugging, syntax highlighting, intelligent code pletion, snippets, code refactoring, and embedded Git. Users can change the theme, board shortcuts, preferences, and install extensions that add additional functionality.

al Studio Code is a source-code editor that can be used with a variety of programming uages, including Java, JavaScript, Go, Node.js, Python, C++, C, Rust and Fortran. It is d on the Electron framework, which is used to develop Node.js Web applications that run the Blink layout engine. Visual Studio Code employs the same editor component lenamed "Monaco") used in Azure DevOps (formerly called Visual Studio Online and al Studio Team Services).

Fig. 5.2 Visual Studio

of the box, Visual Studio Code includes basic support for most common programming uages. This basic support includes syntax highlighting, bracket matching, code folding, configurable snippets. Visual Studio Code also ships with IntelliSense for JavaScript, Script, JSON, CSS, and HTML, as well as debugging support for Node.js. Support for tional languages can be provided by freely available extensions on the VS Code ketplace.

ead of a project system, it allows users to open one or more directories, which can then be ed in workspaces for future reuse. This allows it to operate as a language-agnostic code or for any language. It supports many programming languages and a set of features that ers per language. Unwanted files and folders can be excluded from the project tree via the ings. Many Visual Studio Code features are not exposed through menus or the user rface, but can be accessed via the command palette.

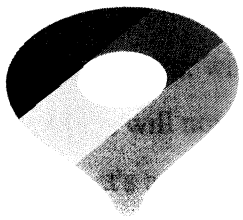
l Studio includes a code editor supporting IntelliSense (the code completion component) ll as code refactoring. The integrated debugger works both as a source-level debugger machine-level debugger. Other built-in tools include a code profiler, designer for ing GUI applications, web designer, class designer, and database schema designer. It ts plug-ins that expand the functionality at almost every level including adding support urce control systems (like Subversion and Git) and adding new tool sets like editors and l designers for domain-specific languages or toolsets for other aspects of the software lopment lifecycle (like the Azure DevOps client: Team Explorer).

l Studio supports 36 different programming languages and allows the code editor and ger to support (to varying degrees) nearly any programming language, provided a age-specific service exists. Built-in languages include C, C++, C++/CLI, Visual Basic T, C#, F#, JavaScript, TypeScript, XML, XSLT, HTML, and CSS. Support for other uages such as Python, Ruby, Node.js, and M among others is available via plug-ins. Java J#) were supported in the past.

most basic edition of Visual Studio, the Community edition, is available free of charge. slogan for Visual Studio Community edition is "Free, fully-featured IDE for students, n-source and individual developers".

gle Maps:

gle Maps is a web mapping platform and consumer application offered by Google. It satellite imagery, aerial photography, street maps, 360° interactive panoramic views of ts (Street View), real-time traffic conditions, and route planning for travelling by foot, bike, air (in beta) and public transportation. As of 2020, Google Maps was being used by 1 billion people every month around the world.



Google Maps

Fig. 5.3 Google Maps

service's front end utilizes JavaScript, XML, and Ajax. Google Maps offers an API that

lows maps to be embedded on third-party websites, and offers a locator for businesses and her organizations in numerous countries around the world. Google mapmaker allowed users collaboratively expand and update the service's mapping worldwide, but was discontinued om March 2017. However, crowdsourced contributions to Google Maps were not ntinued as the company announced those features would be transferred to the Google ocal Guides program.

Google Maps' satellite view is a "top-down" or bird's-eye view; most of the high-resolution magery of cities is aerial photography taken from aircraft flying at 800 to 1,500 feet (240 to 460 m), while most other imagery is from satellites. Much of the available satellite imagery is no more than three years old and is updated on a regular basis, according to a 2011 report. Google Maps previously used a variant of the Mercator projection, and therefore could not accurately show areas around the poles. In August 2018, the desktop version of Google Maps was updated to show a 3D globe. It is still possible to switch back to the 2D map in the settings.

Directions and transit: Google Maps provides a route planner, allowing users to find available directions through driving, public transportation, walking, or biking. Google has partnered globally with over 800 public transportation providers to adopt General Transit Feed Specification (GTFS), making the data available to third parties. The app can indicate users' transit route, thanks to an October 2019 update. The incognito mode, eyes-free walking navigation features were released earlier. A July 2020 update provided bike share routes.

Traffic conditions: In 2007, Google began offering traffic data as a colored overlay on top of roads and motorways to represent the speed of vehicles on particular roads. Crowdsourcing is used to obtain the GPS-determined locations of numerous cellphone users, from which live traffic maps are produced. Google has stated that the speed and location information it collects to calculate traffic conditions is anonymous. Options available in each phone's settings allow users not to share information about their location with Google Maps. Google stated, "Once you disable or opt out of My Location, Maps will not continue to send radio information back to Google servers to determine your handset's approximate location".

Street View: On May 25, 2007, Google released Google Street View, a feature of Google Maps providing 360° panoramic street-level views of various locations. On the date of release, the feature only included five cities in the U.S. It has since expanded to thousands of locations

d the world. In July 2009, Google began mapping college campuses and surrounding and trails. Street View garnered much controversy after its release because of privacy rns about the uncensored nature of the panoramic photographs, although the views are taken on public streets. Since then, Google has blurred faces and license plates through nated facial recognition.

ersive View: It was announced at the Google I/O 2022 event that 3D images would be ed using Street View. It was to be initially in five cities worldwide, with plans to add it her cities later on.

let:

let is the leading open-source JavaScript library for mobile-friendly interactive maps. ghing just about 42 KB of JS, it has all the mapping features most developers ever need.

Fig. 5.4 Leaflet

flet is designed with simplicity, performance and usability in mind. It works efficiently ss all major desktop and mobile platforms, can be extended with lots of plugins, has a utiful, easy to use and well-documented API and a simple, readable source code that is a to contribute to.

flet allows developers without a GIS background to very easily display tiled web maps ted on a public server, with optional tiled overlays. It can load feature data from GeoJSON n, style it and create interactive layers, such as markers with popups when clicked.

developed by Volodymyr Agafonkin, who joined Mapbox in 2013. Leaflet supports Web p Service (WMS) layers, GeoJSON layers, Vector layers and Tile layers natively. Many her types of layers are supported via plugins.

USE CASE DIAGRAM

the Unified Modeling Language (UML), a use case diagram can summarize the details of ur system's users (also known as actors) and their interactions with the system. To build , you'll use a set of specialized symbols and connectors. An effective use case diagram can lp your team discuss and represent:

- Scenarios in which your system or application interacts with people, organizations, or external systems.
- Goals that your system or application helps those entities (known as actors) achieve
- The scope of your system.

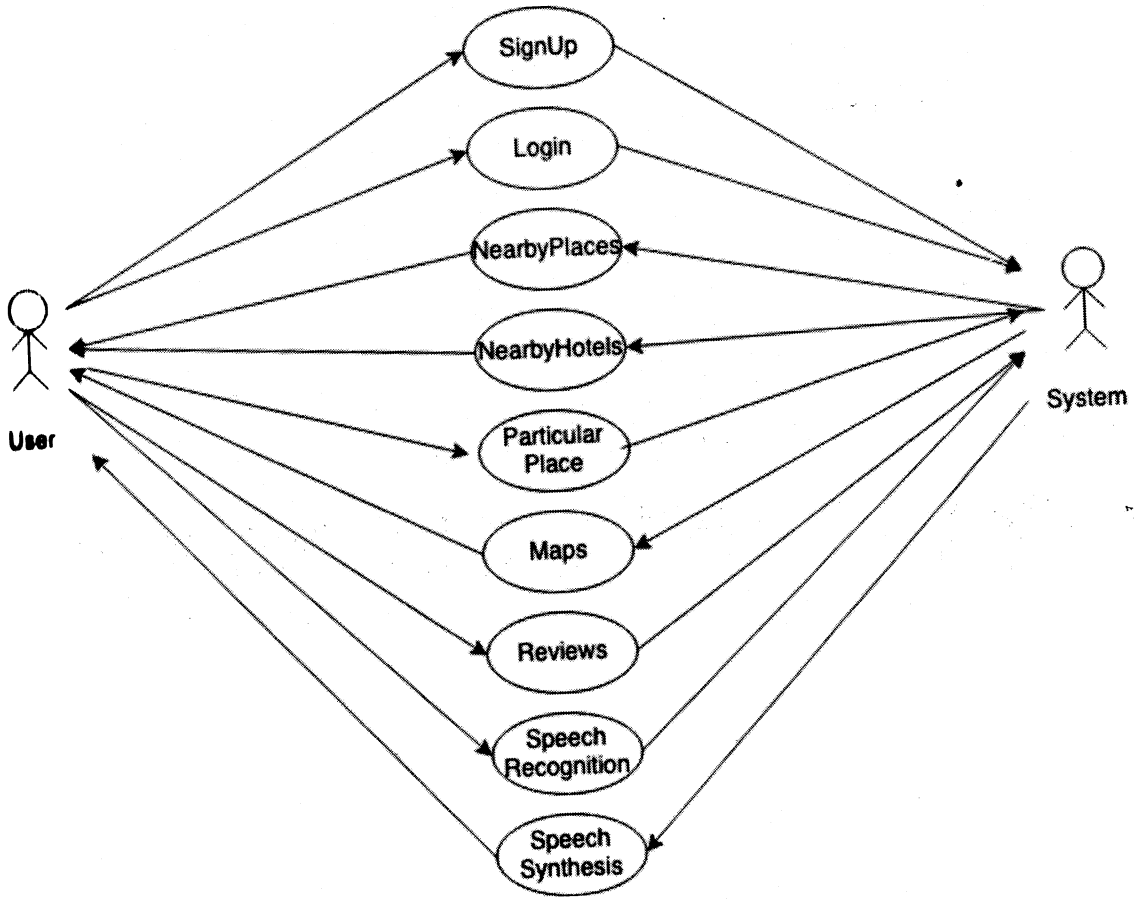


Fig. 5.5 Use case Diagram

This use case diagram shows an interaction between the user and the system. Here the user first ignUp and after login to the system. When the user looks for nearby places and nearby hotels, the user is feeded with particular places and particular hotel details. Later on, if the user wants the location of that then he can easily get the location of that place. These all interactions with the

system happen through the speech recognition and speech synthesis.

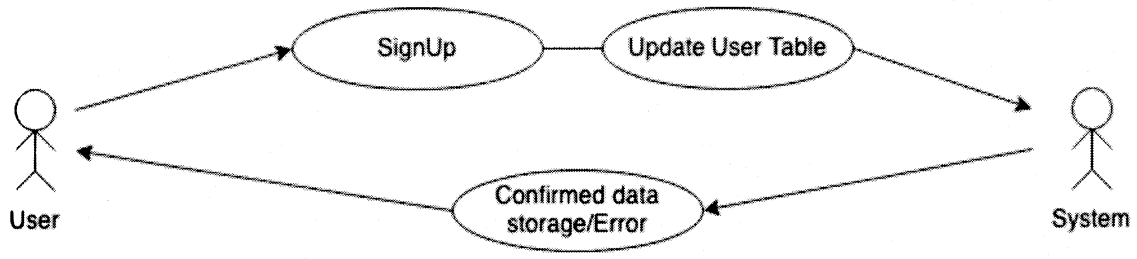


Fig. 5.6 Sign up

User enters credentials into the signup page. System will verify the user data and update the user table in the database. And it returns the acknowledgement of successful signing up else error message will be displayed if user data is invalid.

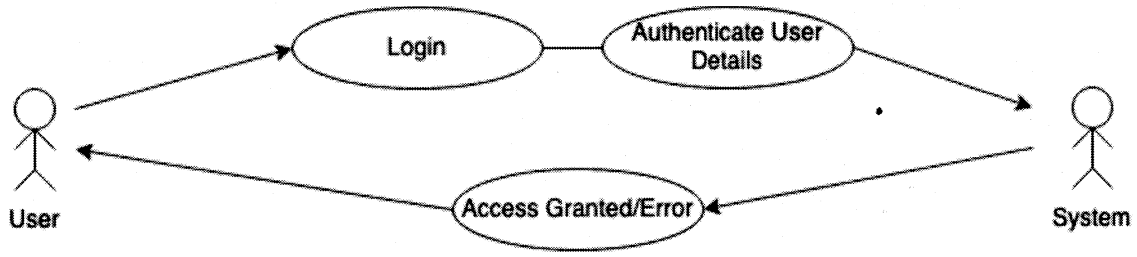


Fig. 5.7 Login

User enters authentication details into the Login page. System will get the authentication details and verify it. If details are correct access will be granted to the user else error messages will be displayed in the case of incorrect credentials.

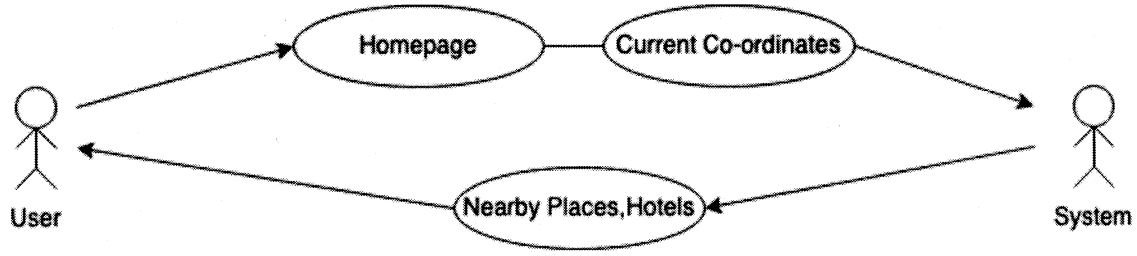


Fig. 5.8 Home Page

When a user enters the homepage, his current coordinates are taken and the nearby places and nearby hotels are suggested to him using his current location. This website reads the current location of the user.

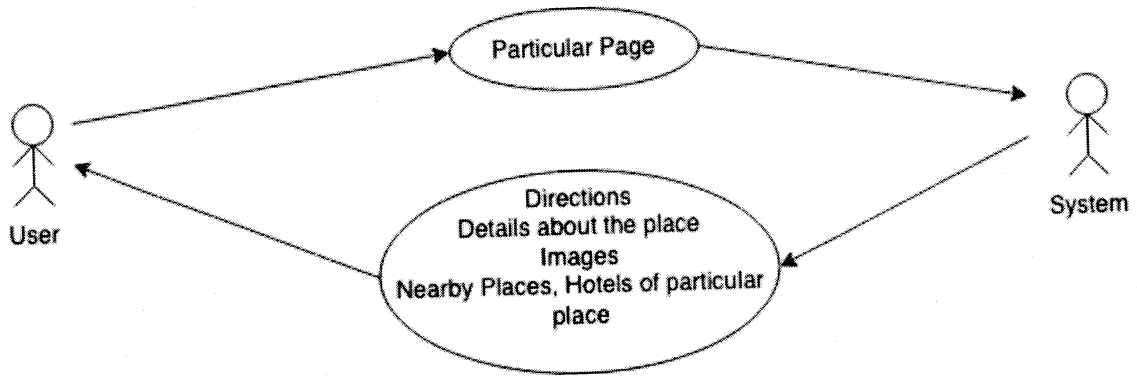


Fig. 5.9 Particular Place

When a user requests for the particular page, the system will return the various details of the particular page like directions to the place, details of the place, images of the place, nearby places and hotels to that place.

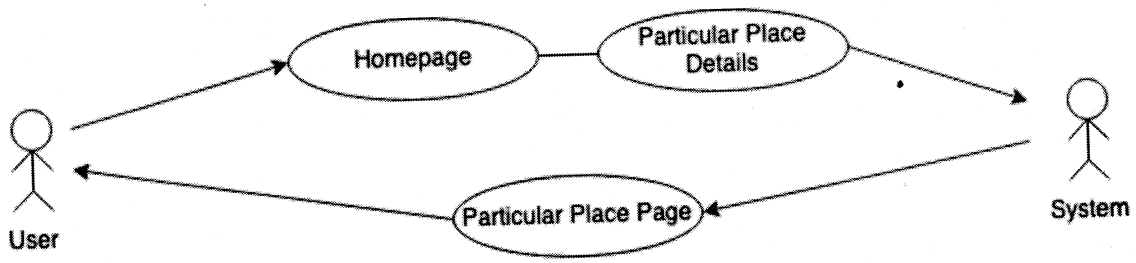


Fig. 5.10 Particular place selection

When a user clicks on the nearby places which are displayed in the home page, the details of that place will be sent to the system to display the particular place page with requested details. Particular place pages will be returned to the user with specific details.

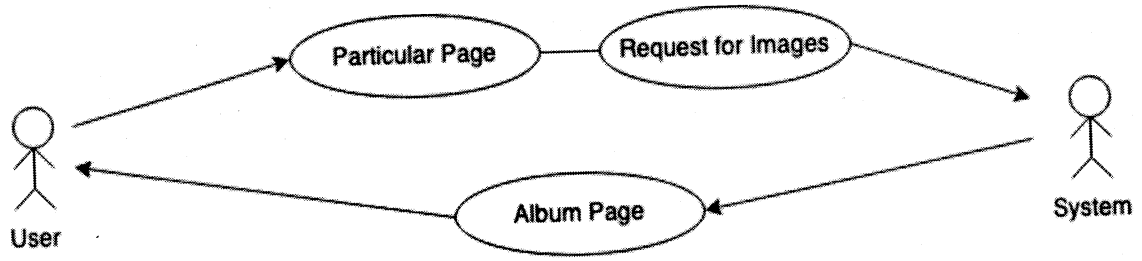


Fig. 5.11 Images

When the user clicks on the show more images in the Particular place page, the image details of that place will be passed to the system and a request to the system will be made to display the album page with specified details. System will return the album page with specified details.

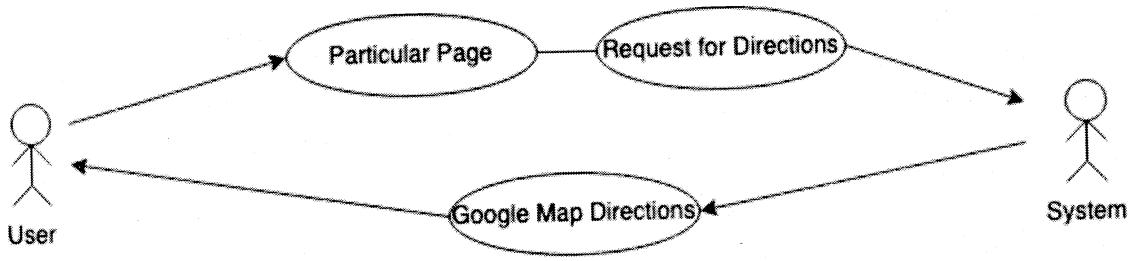


Fig. 5.12 Map Directions

A user when in a particular place page then the user requests for direction to the database. Then with the help of the google maps API the user gets the directions to the current place he is looking.

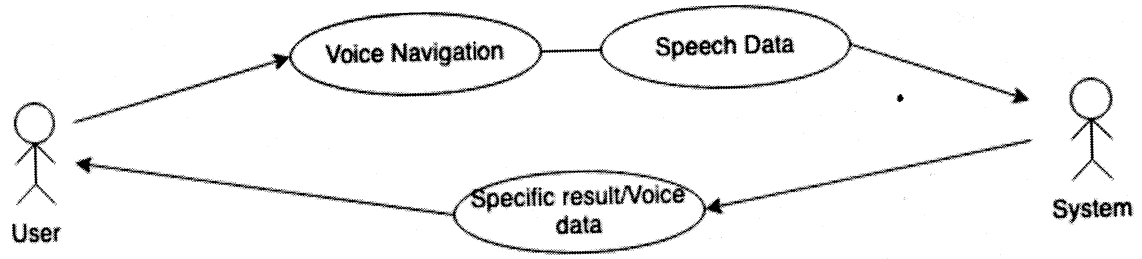


Fig. 5.13 Voice Navigation

When the user clicks on the say button, the speech recognition function will be triggered. Recognized speech details will be sent to the system. Based on speech data, decisions will be made and sent to the user.

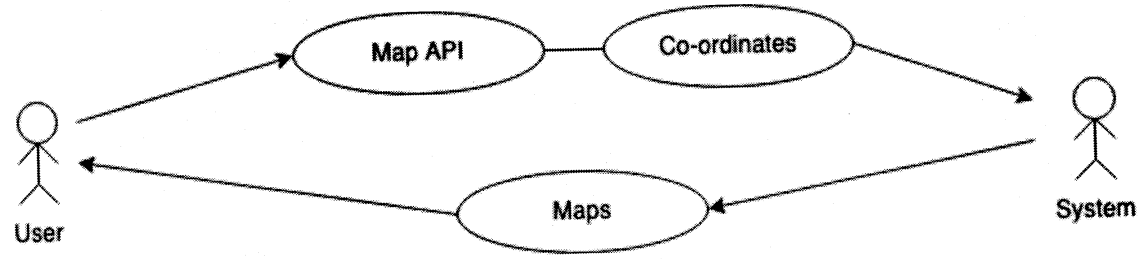


Fig. 5.14 Maps

When the user loads the page with the map. The coordinates of the user will be fetched and sent to the system. Based on the coordinates the maps will be returned to the user.

5.3 SEQUENCE DIAGRAM

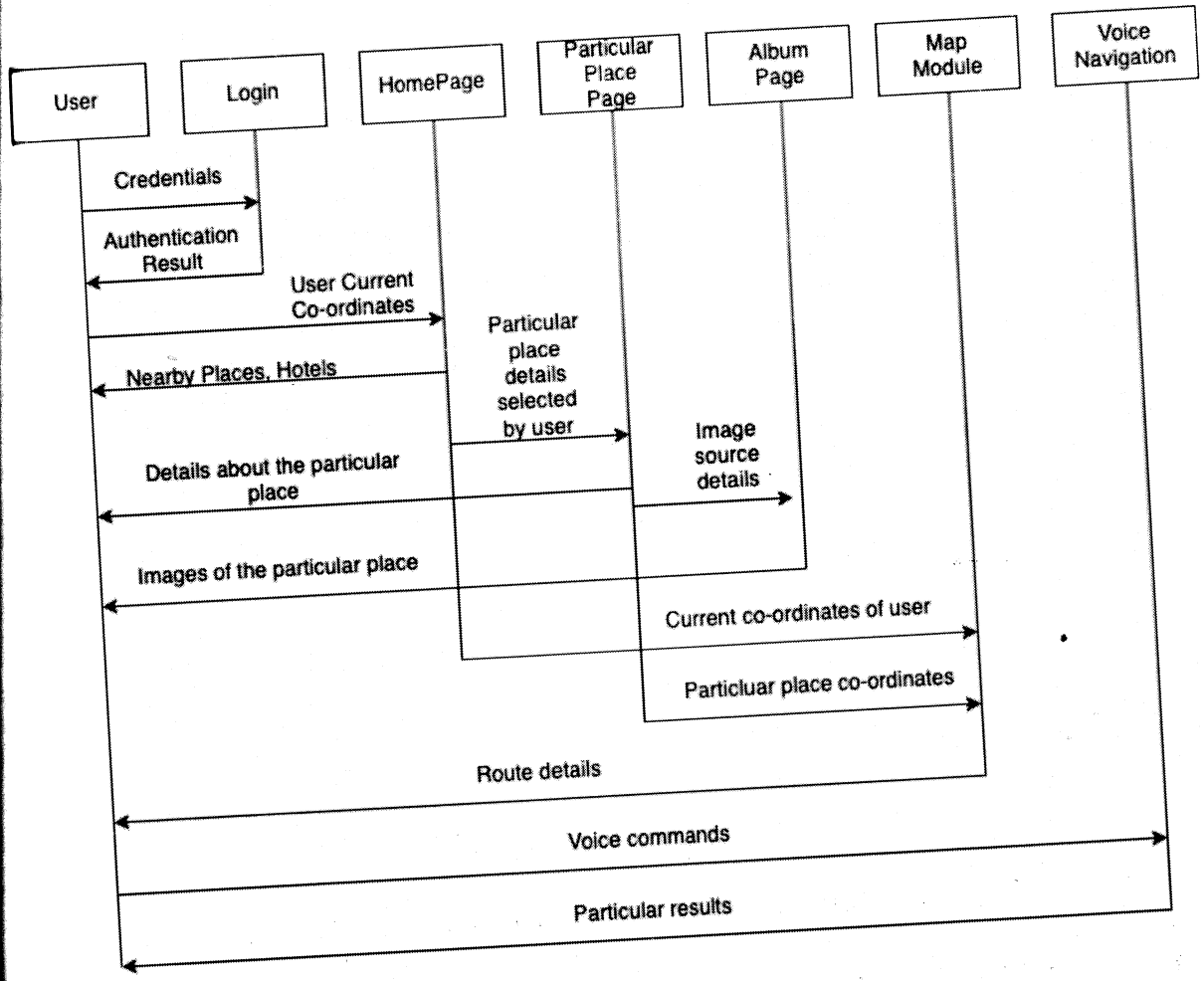


Fig. 5.15 Sequence Diagram

1. User will send the credentials to the login page.
2. System will authenticate the user and send the authentication result, that is, gives access to the user in the case of correct credentials, else the error message in the case of incorrect credentials.
3. Home page will be loaded with the user's current coordinates.
4. Home page will return the nearby places, hotels based on the user's current coordinates.
5. When a user clicks on a particular place, the details of that place will be sent to the particular page component.
6. Based on details received from the home page the particular page with specific details will be returned to the user.
7. When user clicks on images of particular page, the details about the images will be sent to

album component

8. Album component will return the page with specific results to the user.
9. Map component will receive the user coordinates from home page component and particular place coordinates from particular place when user loads map component.
10. Map component will return the map to the user with the received details.
11. Voice navigation component will receive the voice commands from the user.
12. Voice navigation component will return the specific result to the user based on decision made on the user speech command.

5.4 PSEUDOCODE

In this project, we have some of the core modules that implement the main functionalities of the workflow of the project. Here we have described Pseudocode for some of the core modules that are present in our project.

Pseudocode for Home Page:

1. Ask the user for permission to access the user location.
2. Get particular user coordinates from useGeolocated hook.
3. If coordinates are available
    a. Load Map with coordinates of user
    b. Fetch nearby Locations, Hotels and other places
    c. Show nearby Locations, Hotels and other places
    d. Load voice Navigator
4. Else
    a. Give Error Message

Pseudocode for Particular Place:

1. Select a particular Location
2. Fetch details from useLocation hook
3. Fetch nearby Places and Hotels from Database
4. Load Map with Coordinates of the place
5. Load Description of Place
6. Load Images of Place
7. Load nearby Locations

8. Load nearby Hotels
9. Load Voice Navigator

Pseudocode for Voice Navigation:

1. Press Voice Navigation Button
2. Call Voice Navigation function, passing all details as parameters
3. Deploying predefined commands into useSpeechRecognition hook
4. Create objects of Speech Synthesis
5. Start speech recognition by calling function SpeechRecognition.startListening
6. Store recognized data into variable "data" using useState hook
7. Decision will be made based upon value stored in "data"
    a. If data is valid
        i. Show particular results
    b. Else
        i. Give error message
8. Stop speech recognition by calling SpeechRecognition.stopListening
9. Start Speech Synthesis by calling function "speak"
10. Stop Speech Synthesis by calling the function "cancel"

5.5 PACKAGES

Packages are open-source predefined functions or classes that can be used in programs. Here are some of the packages that we are using in our project.

Geolib: Library to provide basic geospatial operations like distance calculation, conversion of decimal coordinates to sexagesimal and vice versa, etc. This library is currently 2D, meaning that altitude/elevation is not yet supported by any of its functions. This library is written in TypeScript. You don't have to know TypeScript to use Geolib, but the type definitions give you valuable information about the general usage, input parameters etc.

All methods that are working with coordinates accept either an object with a lat/latitude and a lon/lng/longitude property, or a GeoJSON coordinates array, like: [lon, lat]. All values can be either in decimal (53.471) or sexagesimal (53° 21' 16") format. Distance values are always floats and represent the distance in meters.

getDistance(start, end, accuracy = 1):

Calculates the distance between two geo coordinates.

This function takes up to 3 arguments. First 2 arguments must be valid GeolibInputCoordinates (e.g. {latitude: 52.518611, longitude: 13.408056}). Coordinates can be in sexagesimal or decimal format. The third argument is accuracy (in meters). By default the accuracy is 1 meter. If you need a more accurate result, you can set it to a lower value, e.g. to 0.01 for centimeter accuracy. You can set it higher to have the result rounded to the next value that is divisible by your chosen accuracy (e.g. 25428 with an accuracy of 100 becomes 25400).

React-speech-kit:

Speak: function({text: string, voice: SpeechSynthesisVoice})

Call to make the browser read some text. You can change the voice by passing an available SpeechSynthesisVoice (from the voices array). Note that some browsers require a direct user action to initiate SpeechSynthesis. To make sure it works, it is recommended that you call speak for the first time in a click event handler.

Listen: function({interimResults: boolean, lang: string})

Cancel: Call to make SpeechSynthesis stop reading.

Voices: An array of available voices which can be passed to the speak function. An example SpeechSynthesisVoice voice has the following properties.

Call to make the browser start listening for input. Every time it processes a result, it will forward a transcript to the provided onResult function.

The language the SpeechRecognition will try to interpret the input in. Use the languageCode from this list of languages that Chrome supports (here) SpeechRecognition can provide real time results as it's trying to figure out the best match for the input. Set to false if you only want the final result.

react-leaflet: React Leaflet provides bindings between React and Leaflet. It does not replace

Leaflet, but leverages it to abstract Leaflet layers as React components. As such, it can behave differently from how other React components work, notably.

Lifecycle process

1. The MapContainer renders a container element for the map. If the placeholder prop is set, it will be rendered inside the container .
2. The MapContainer instantiates a Leaflet Map for the created with the component properties and creates the React context containing the map instance.
3. The MapContainer renders its children components.
4. Each child component instantiates the matching Leaflet instance for the element using the component properties and context, and adds it to the map.
5. When a child component is rendered again, changes to its supported mutable props are applied to the map.
6. When a component is removed from the render tree, it removes its layer from the map as needed.

5.6 HOOKS

Hooks are functions that let you "hook into" React state and lifecycle features from function components. Hooks don't work inside classes — they let you use React without classes.

useState: useState is a Hook (we'll talk about what this means in a moment). We call it inside a function component to add some local state to it. React will preserve this state between re-renders. useState returns a pair: the current state value and a function that lets you update it. You can call this function from an event handler or somewhere else. It's similar to this.setState in a class, except it doesn't merge the old and new state together. (We'll show an example comparing useState to this.state in Using the State Hook.).

The only argument to useState is the initial state. In the example above, it is 0 because our counter starts from zero. Note that unlike this.state, the state here doesn't have to be an object — although it can be if you want. The initial state argument is only used during the first render.

useEffect: The useEffect Hook allows you to perform side effects in your components. Some examples of side effects are: fetching data, directly updating the DOM, and timers. useEffect accepts two arguments. The second argument is optional.

useEffect(<function>, <dependency>)

useContext: React Context is a way to manage state globally. It can be used together with the useState Hook to share state between deeply nested components more easily than with useState alone. State should be held by the highest parent component in the stack that requires access to the state.

The solution is to create context.To create context, you must Import createContext and initialize it:Wrap child components in the Context Provider and supply the state value. Now, all components in this tree will have access to the user Context.

useRef: The useRef Hook allows you to persist values between renders. It can be used to store a mutable value that does not cause a re-render when updated. It can be used to access a DOM element directly.

Does Not Cause Re-renders If we tried to count how many times our application renders using the useState Hook, we would be caught in an infinite loop, since this Hook itself causes a re-render.

To avoid this, we can use the useRef Hook. useRef() only returns one item. It returns an object called current. When we initialize useRef we set the initial value: useRef(0).

useNavigate: The useNavigate hook returns a function that lets you navigate programmatically, for example after a form is submitted. If using replace: true, the navigation will replace the current entry in the history stack instead of adding a new one.

The navigate function has two signatures:

- Either pass a to value (same type as <Link to>) with an optional second {replace, state}arg or
- Pass the delta you want to go in the history stack. For example, navigate (-1) is equivalent to hitting the back button.

useLocation: This hook returns the current location object. This can be useful if you'd like to perform some side effects whenever the current location changes.

useSpeechRecognition: useSpeechRecognition is a React hook that gives component access to a transcript of speech picked up from the user's microphone. SpeechRecognition manages the global

state of the Web Speech API, exposing functions to turn the microphone on and off.

Under the hood, it uses Web Speech API. Note that browser support for this API is currently limited, with Chrome having the best experience - see supported browsers for more information.

useSpeechSysnthesis: The SpeechSynthesis interface of the Web Speech API is the controller interface for the speech service; this can be used to retrieve information about the synthesis voices available on the device, start and pause speech, and other commands besides.

A react hook for the browser's SpeechSynthesis API. It exposes the options and controls to the underlying SpeechSynthesis in the browser. The SpeechSynthesis interface of the Web Speech API is the controller interface for the speech service; this can be used to retrieve information about the synthesis voices available on the device, start and pause speech, and other commands besides.

useGeolocated: Access to data from the Geolocation API needs user permission. If permission to access geolocation was previously granted by the user, geolocation data will be available. If permission to access was not granted previously, the user will be prompted to give permission when the component mounts.

If permission was previously denied by the user, if the user agent does not support the Geolocation API, or if some other error occurs, the object returned from the hook will still contain all members, and values will be null.

6. SYSTEM IMPLEMENTATION AND TESTING

These are the few important code snippets which provide the details about the nearby places, nearby hotels and other few important code snippets.

Login and Signup code snippet:

```
useEffect(() => {
  calc();
  let unmounted = false;
  if (cu.currentUser !== null) {
    logout();
  }
  return () => {
    unmounted = true;
  };
}, []);
async function handleSubmit(e) {
  e.preventDefault();
  try {
    setError("");
    setLoading(true);
    await login(emailRef.current.value, passwordRef.current.value);

   try {
    setError2("");
    setLoading(true);

     await signup(emailRef5.current.value, passwordRef3.current.value);

     setError2("Login to Continue");
     //history.push("/");
    } catch {
     setError2("Failed to create an account");
    }

    setLoading(false);
```

```
}
function out() {
 var m3 = document.getElementById("main3").style;
 m3.display = "none";
}
function out2() {
 var m3 = document.getElementById("main13").style;
 m3.display = "none";
}
async function handleSubmit3(e) {
 e.preventDefault();

 try {
  setMessage("");
  setLoading(true);
  await resetPassword(emailRef3.current.value);
  setError("Check your inbox for further instructions");
  out();
 } catch {}

 setLoading(false);
}
async function handleSubmit31(e) {
 e.preventDefault();

 try {
  setMessage("");
  setLoading(true);
  await resetPassword(emailRef6.current.value);
  setError("Check your inbox for further instructions");
  out2();
 } catch {}

 setLoading(false);
}
function userClick() {
 if (flag == 0) {
```

In the above-mentioned code snippet the details about nearby places, nearby hotels and recommended places are fetched and displayed to the user. The dataFetch() function will be called whenever the component is loaded and all the data related to it is fetched. Using geolib, nearby places and hotels are filtered out of all places based upon users current location.

Particular Place Details code snippet:

```
import { useLocation, Link } from "react-router-dom";
import { useNavigate } from "react-router";
import Map from "../../maps/Map";
import "./PlaceDet.scss";
import Speech from "../../voice/Btn.js";
import firebase from "../../firebase";
import Slider from "../sliderUI.js";
import $ from "jquery";
export default function PlaceDet() {
  let i = 0,
    j = 0;
  let sr = React.createRef();
  let place = useLocation();
  function mouseControl(e) {
    document.getElementById("mouse").style.display = "block";
    document.getElementById("mouse").style.left = e.clientX + "px";
    document.getElementById("mouse").style.top = e.clientY + "px";
    document.getElementById("mouse2").style.display = "block";
    document.getElementById("mouse2").style.left = e.clientX + "px";
    document.getElementById("mouse2").style.top = e.clientY + "px";
    document.getElementById("mouse3").style.display = "block";
    document.getElementById("mouse3").style.left = e.clientX + "px";
    document.getElementById("mouse3").style.top = e.clientY + "px";
    document.getElementById("mouseTitle").style.display = "block";
    document.getElementById("mouseTitle").style.left = e.clientX + "px";
    document.getElementById("mouseTitle").style.top = e.clientY + "px";
  }
  function disable() {
    document.getElementById("mouse").style.display = "none";
    document.getElementById("mouse2").style.display = "none";
    document.getElementById("mouse3").style.display = "none";
```

```
 document.getElementById("mouseTitle").style.display = "none";
}
function show() {
 document.getElementById("innerMouseTitle").style.display = "flex";
 document.getElementById("innerMouseTitle").style.animation =
  "animatPlace 5s linear forwards";
}
function out() {
 document.getElementById("innerMouseTitle").style.display = "none";
}
const center = {
 lat: place.state.lat,
 lng: place.state.long,
};
const array = [];
function dataFetch() {
  firebase
    .database()
          .ref("Places")
```

In the above code snippet, the map will be loaded, the details about the nearby places and hotels will be displayed in a slider. It will check if the geolocation is enabled or not,if not then the error messages will be displayed. Voice module will be loaded with the required details.

Map Coordination code snippet:

```
import { React, useState } from "react";
import "./Comp2.css";
import { useGeolocated } from "react-geolocated";
// import {
//  GoogleMap,
//  useJsApiLoader,
//  Marker,
```

```
// DirectionsRenderer,
// } from "@react-google-maps/api";
import { MapContainer, TileLayer, useMap, Marker, Popup } from "react-leaflet";
export default function Map({ center, destination, zoom }) {
 let s;
 const { coords, isGeolocationAvailable, isGeolocationEnabled } =
  useGeolocated({
   positionOptions: {
    enableHighAccuracy: true,
   },
   userDecisionTimeout: 5000,
  });
 if (coords) {
  s = `https://www.google.com/maps/dir/${coords.latitude}, ${coords.longitude}/
${center.lat} ${center.lng}`;
 } else {
  s = `https://www.google.com/maps/dir/16.172,75.657/${center.lat},${center.lng}`;
 }
 return (
  <MapContainer id="map" center={center} zoom={zoom} scrollWheelZoom={true}>
   <TileLayer url="https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png" />
   <Marker position={center}>
    <Popup>
     <a href={s}>Direction</a>
    </Popup>
   </Marker>
  </MapContainer>
 );
```

In the above code snippet, the map will be returned with the coordinates, zoom level which are passed as parameters. The url for the Google Maps with the user current coordinates and destination coordinates will be tied with the marker of the particular place. The maps are displayed

with leaflet packages available free of cost.

Speech Recognition code snippet:

```
import React, { useState } from "react";
import { useNavigate } from "react-router";
import { useSpeechSynthesis } from "react-speech-kit";
import "./Btn.scss";
import { useGeolocated } from "react-geolocated";
import SpeechRecognition, {
 useSpeechRecognition,
} from "react-speech-recognition";
let fl = true;
export default function Btn({
 history2,
 current,
 dataSet,
 pos,
 hotel,
 dataEdu,
}) {
 const history = useNavigate();
 const { speak, cancel, voices } = useSpeechSynthesis();
 const [data, setData] = useState("");
 const [understand, setUnderstand] = useState(false);
 const { coords, isGeolocationAvailable, isGeolocationEnabled } =
  useGeolocated({
   positionOptions: {
    enableHighAccuracy: true,
   },
   userDecisionTimeout: 5000,
  });
 const voice = voices[8];
```

```
const commands = [
 {
  command: [
   "*",
   "hello *",
   "nearby *",
   "goto *",
   "select *",
   "select image number *",
   "show *",
   "give me *",
   "tell me *",
   "guide go on *",
   "guide get *",
  ],
  callback: (redirectPage) => setData(redirectPage),
 },
];
```

In the above code snippet, possible commands are defined. These commands are deployed in the useSpeechRecognition hook. "givePermission" function is defined, which is used to start or stop the speechRecognition. The request of the user will be stored in the variable "data",based on this variable required decision will be made. For speech recognition, useSpeechRecognition hook is used and for speech synthesis useSpeechSysnthesis is used.

6.1 DESKTOP IMPLEMENTATION

Initially the new user needs to sign up before using the website. The user needs to first sign up for the web page using email id and password which should be of max 6 characters in length. The user's account gets authenticated, then user is notified to login to the website.

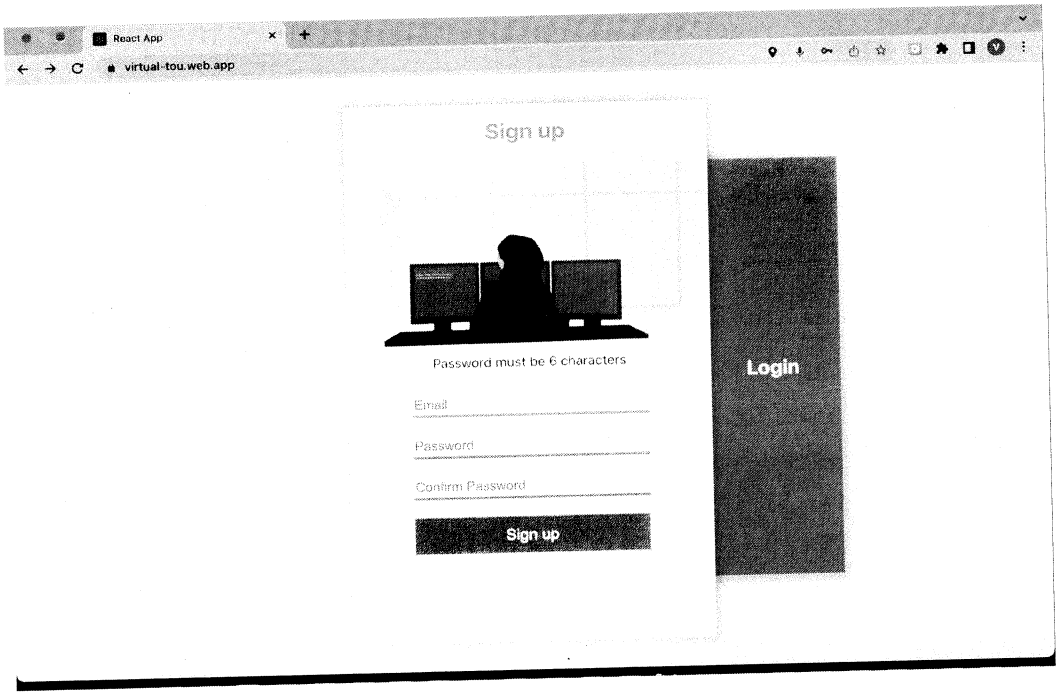


Fig. 6.1 Sign up Page

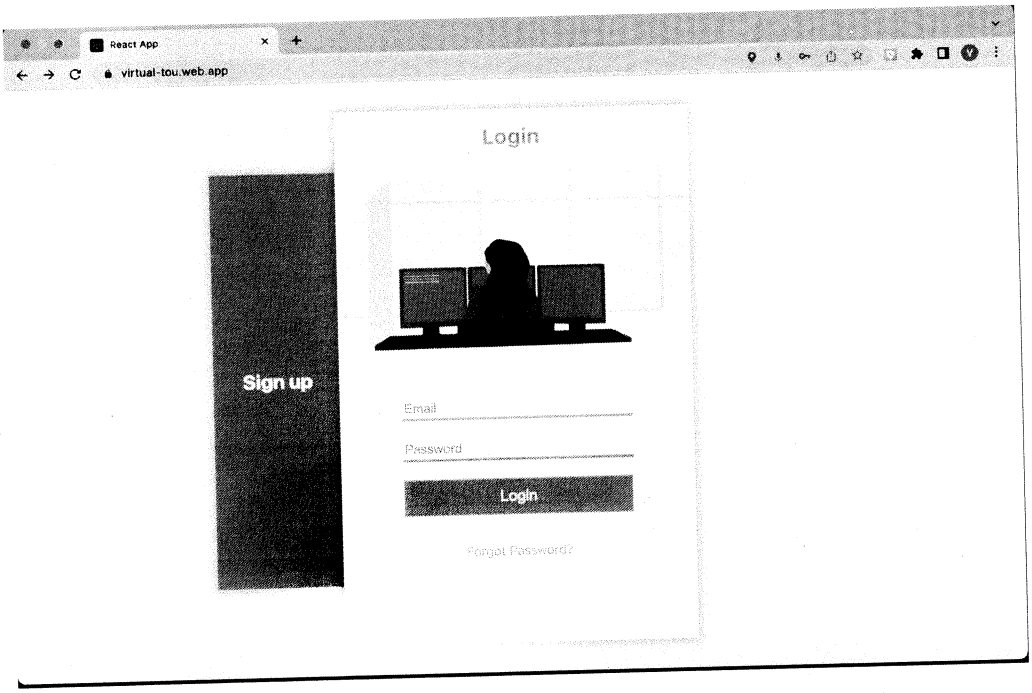


Fig. 6.2 Login Page

Once the user account is authenticated. The user has to login with theregistred credentials. If the user does not have the account, then he has to sign up first. After logging in the user enters the Home page of the website.

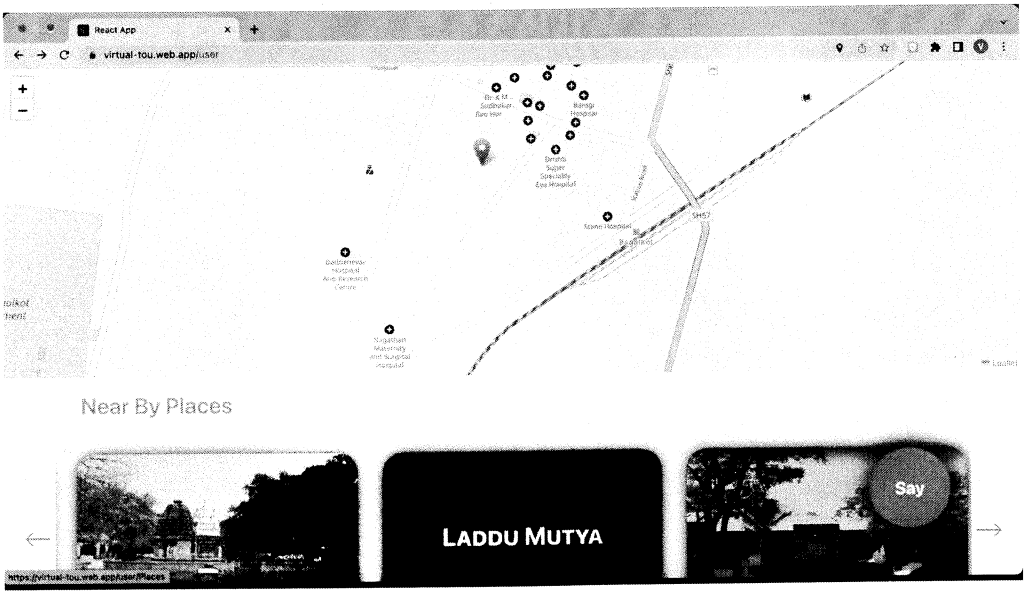


Fig. 6.3 Home Page

Once the user signs in, the home page is displayed initially with the map locating the user. Then the cards containing information about the nearby places and next the nearby hotels are displayed. Homepage also consists of the voice module navigator button called "say".

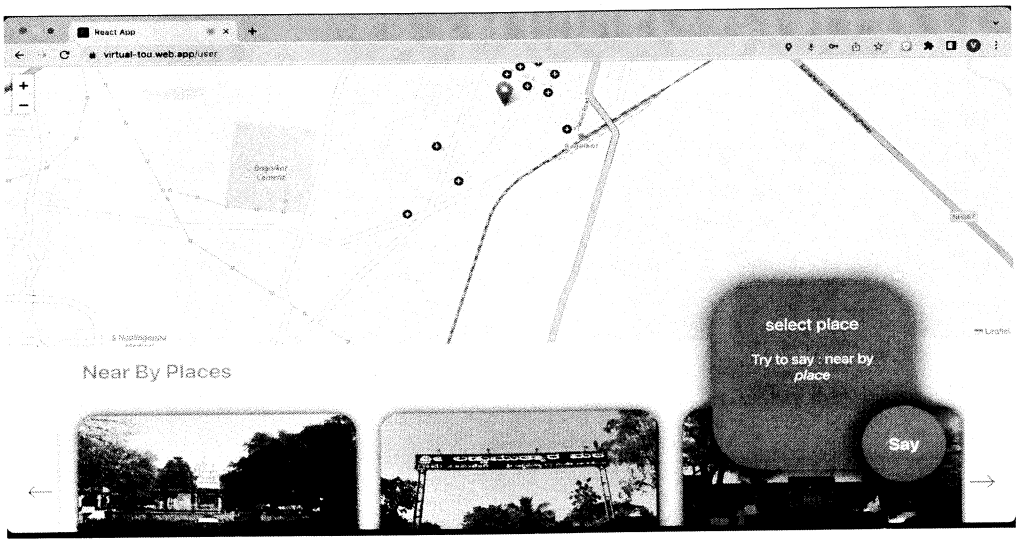


Fig. 6.4 Voice Navigator

In this page there is a module called "say" button which is built using react-speech-kit. This module helps the user to interact with the website using speech. The website navigation can be done through voice-based interaction.

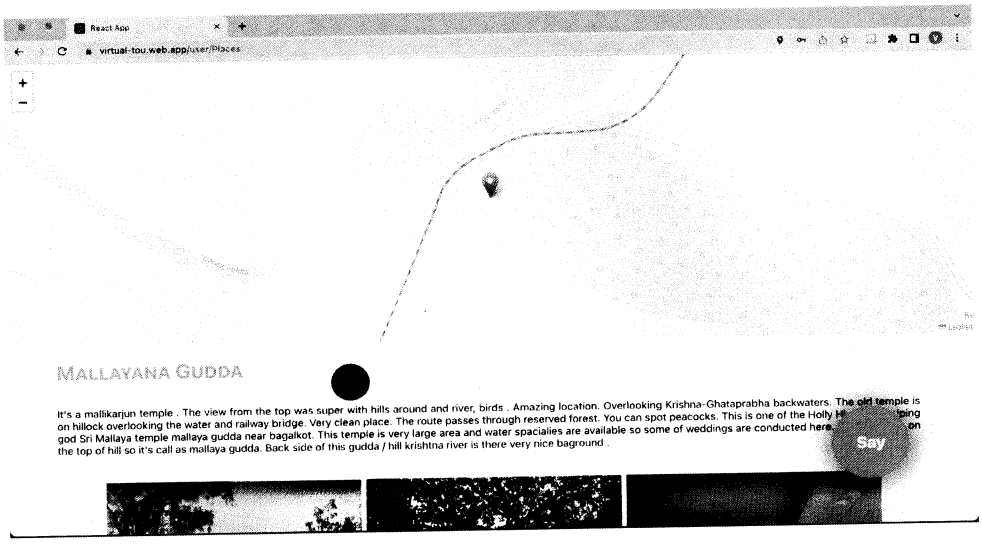


Fig. 6.5 Locating a Particular Place

When the user selects a particular place the details regarding the palace are fetched and displayed. First the map shows the location of the selected place, Next the description or the History about the place is displayed. Then the images related to the places. There is an option for even more images. Next the nearby places that are located near to the users location are displayed.

Fig. 6.6 Images of that Particular Place

This page has a collection of pictures of that particular place and the pictures have multiple angle photos of that place. The user can interact with the page using voice module called "say" in that webpage.

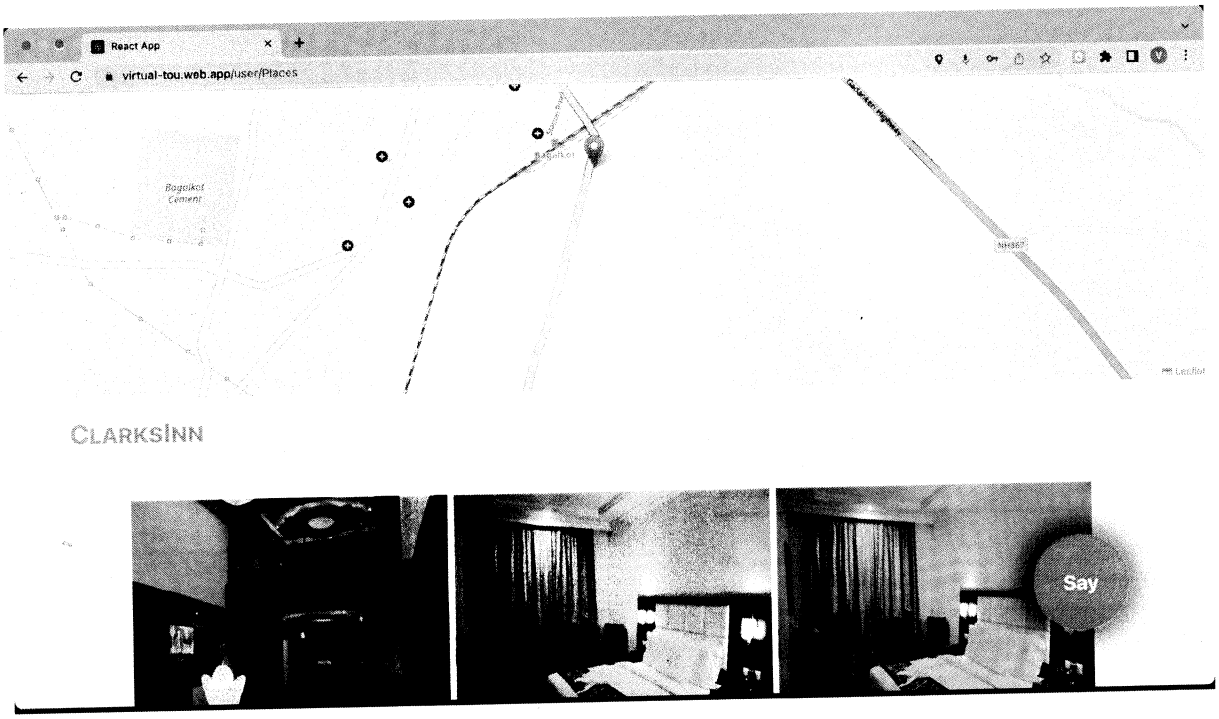


Fig. 6.7 Locating a Particular Hotel

When the selects a particular hotel, the location of the hotel is shown in the maps. This webpage shows details of the hotel like reviews of the customer, photos of the hotel and it can also be controlled using a voice module.

6.2 MOBILE IMPLEMENTATIONS

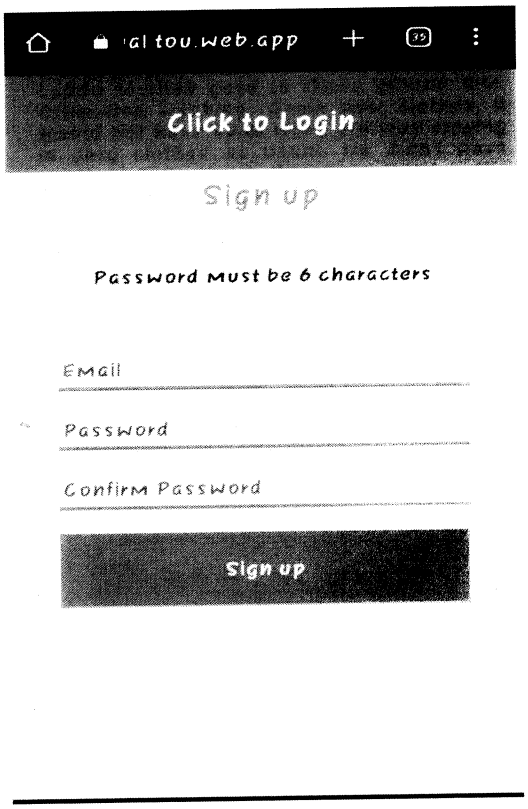


Fig. 6.8 Signup page

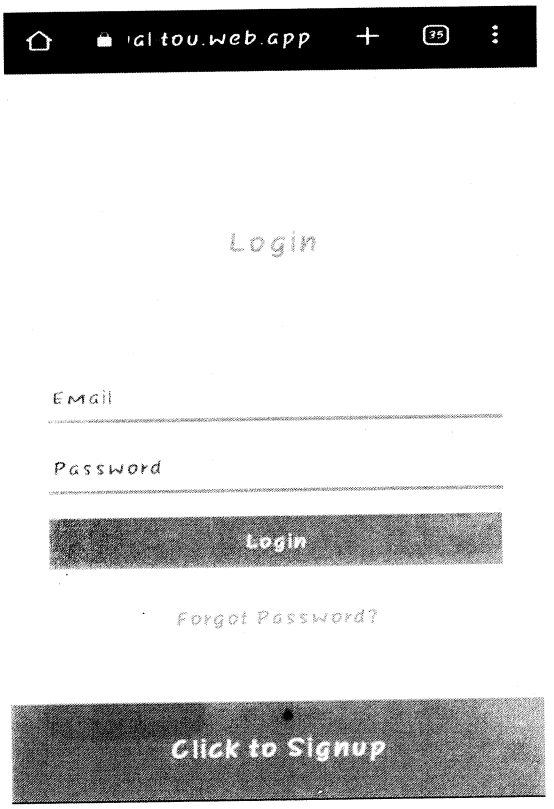


Fig. 6.9 Login page

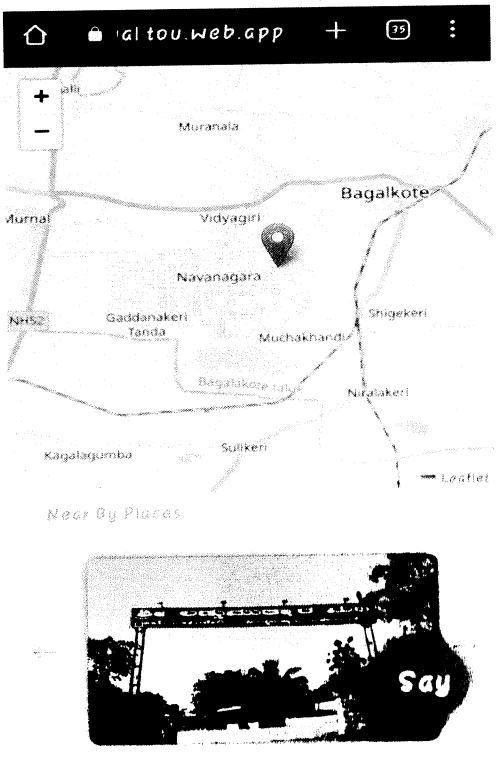


Fig. 6.10 Home page

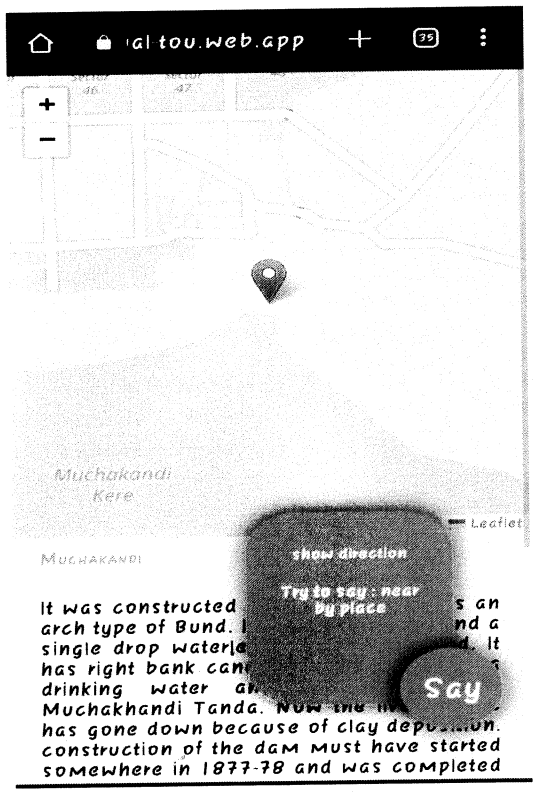
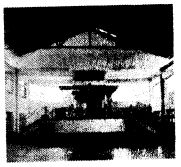


Fig. 6.11 Voice Navigator

History akeri Cross and made it easy for them to live there. He spent nearly 20 years on the streets of Bagalkotai, gradually becoming old and mildly sick. Having already become known as a divine figure, the people of Bagalkotte were buried near the nearby Gadanakeri Cross. Whatever Laddu Muttiah gave to those around him. Otherwise washing. Given new clothes, it would not have been worn. He was staying in dirty clothes as usual. He didn't have much to talk about. Speaking didn't make sense.



See more images

Near By Places

Fig. 6.12 Images of the Place

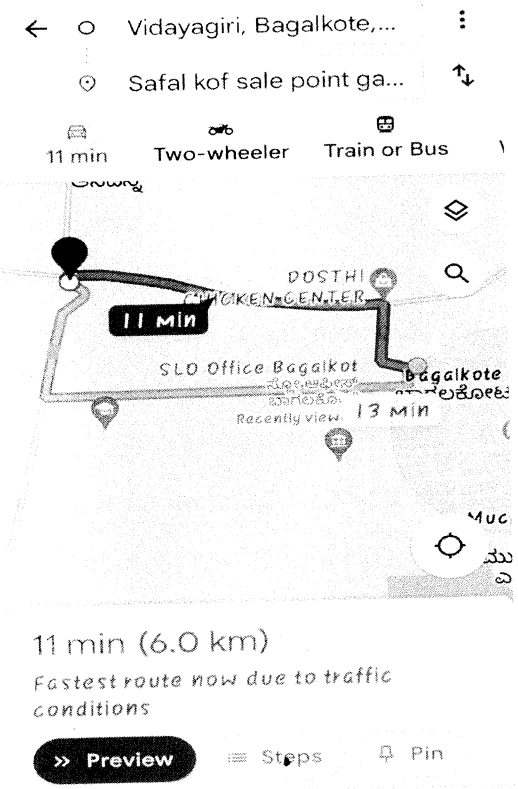


Fig. 6.13 Route Map

7. CONCLUSION

We are designing a web application in such a way that we are trying to completely eliminate the middleman i.e., the agent and whatever the work done by that guide can be done by our application. So it's a more efficient and user-friendly application. Our Application provides recommendations for food and accommodation. Our application will provide a complete guide and planning for all the journey needs of the users. Users will be experiencing a new way of tourism through our web application. Our project helps in the promotion of local tourism, which in turn provides the tourist with an exploration of the local culture. This helps local people to grow by bringing the economy to local people and also a great amount of development to the local places like cleanliness and overall development. This also ensures the overall development of the country.

7.1 FUTURE SCOPE

As of the future scope for the current project, the problem with the current tourist website serves a single purpose whereas this project counters that problem by providing multipurpose functionalities. This can extensively be used by tourists for traveling as well as accommodation and their suitable foods at particular places. Hence, further more necessary functionalities could be added making it more user-friendly, and it might easily replace other websites which are solely made for tourists and to promote tourism. This project also supports regional tourism which other websites lack, they only mention famous and known places and fail to mention the places which are locally famous but fail to get noticed by other locality tourists. This project currently contains some locality places present in Bagalkot, Karnataka, furthermore it can be made in such a way to include any desired places requested by people.

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B.V.V. Sangha's

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BAGALKOTE-587103

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DEPARTMENT OF MANAGEMENT STUDIES

MBA PROGRAMME

2021-22

Internship Report on

"ORGANIZATION STUDY AT FINCARE SMALL FINANCE BANK"

Submitted in partial fulfilment of the requirements for the award of the degree of

MASTER OF BUSINESS ADMINISTRATION

Submitted by

Mr. Channabasav S. Hiremath

USN:2BA20BA009

Under the Guidance of

Internal Guide

Dr.R.B. Tapashetti

Department of Management Studies,
Basaveshwar Engineering College (A) Bagalkot

External Guide

Mr. Akshay Sanghi

B.V.V.S

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Department of Management Studies

MBA Programme

CERTIFICATE OF APPROVAL OF INTERNSHIP REPORT

2021-2022

This is to certify that **Mr. Channabasav S. Hiremath** student of MBA III semester has satisfactorily completed the Internship at **Fincare Small Finance Bank** in partial fulfilment of MBA Programme in Department of Management Studies, Basaveshwar Engineering College (Autonomous), Bagalkot. Affiliated to Visvesvaraya Technological University, Belagavi.

Dr.R.B. Tapashetti	**Dr. Rashmi R. Hunnur**	**Dr.S.S. Injaganeri**
Internal Guide	**Head of the Department**	**Principal**

Viva-Voce Examination

Name of the Examiners	Signature with date
1. Brijmohan A. Vyas	14/3/22
2. Dr. Rashmi R. Hunnur	14/3/2022

fincare
Small Finance Bank

INTERNSHIP CERTIFICATE

Date: 02 November 2021

Name: Channabasav Hiremath

Sub: Internship Completion Letter

We are glad to inform that Mr. Channabasav Hiremath from Basaveshwar Engineering College (Autonomous) Bagalkote has successfully completed his internship with **Fincare Small Finance Bank** from **02-09-2021 to 21-10-2021.**

During this internship period he was exposed to the various activities in savings account products.

We found him to be active and hardworking. He was interested to learn the functions of our Core division and was putting his best efforts to get the depth of the subject.

His association with us was fruitful and we wish him all the best for future endeavours.

Yours truly

For Fincare Small Finance Bank Ltd.

Authorized Signatory

Shivaraj M H
Deputy General Manager - HR

DECLARATION

I am **Channabasav Hiremath** here by state that this Internship report in Fincare Small Finance Bank, Bangalore written and submitted by me under the guidance of Dr.R.B. Tapashetti, Faculty at Department of Management Studies, Basaveshwar Engineering college (A), Bagalkot.

I have undergone an internship for four weeks. I further declare that this report is based on the original study undertaken by me and has not been submitted earlier to or any other institution.

The matter in this report is collected by me, under the guidance of Mr. Nishchya Nath and Akshay Sangi.

Place: Bagalkot

Signature

Date:

Channabasav Hiremath

ACKNOWLEDGEMENT

I am the student of **"Basaveshwar Engineering College [A] Department of Management Studies, M.B.A III Sem"** very grateful to all the people who have provided their precious time and advice for making this project successful.

I Thank **Dr. S.S. Injagneri (Principal)**, Basaveshwar Engineering College (A), Bagalkot for his Help and Support to do this Internship.

I am also Thankful to **Dr. Rashmi Hunnur** M.B.A (Head of The Department) for her valuable support.

I am very grateful to **"Fincare Small Finance Bank"** for providing me opportunities to conduct this in their organization.

I am thankful to **Mr. Nishchya Nathand Mr. Akshay Sangi** for providing me opportunities to carry my project in their organization.

I am heartily thankful to my external guide **Mr. Nishchya Nath**and all other staff members for their valuable guidance and for supporting me by sharing their experience, as well as for guiding me in training successfully.

I am Deeply Indebted to my college Guide **Dr.R.B. Tapashetti** (Assistant Professor) Department of management studies (M.B.A) for her valuable support and guidance.

EXECUTIVE SUMMARY

Banking system is an important constituent of overall economic system. It plays an important role in mobilizing the nation's savings and channelizing them into high investment priorities and better utilization. The evolution of banking system in India is a gradual and continuous process since ancient times. The present study is the most significant study to understand the contribution of private sector banks by studying about their financial performance.

The internship report is a brief discussion of the functions which are being performed at Fincare Small Finance Bank. Fincare Small Finance Bank was established in 2017 and it is one of the major commercial banks in India. The Bank is making every effort to meet the upcoming challenges through strategic planning and making the best use of the resources at fix command. It has planned to institute major improvements in customer services and internal system to improve efficiency. The Bank has also innovative products, which consists of two types of account they are 101 zero balance account and 101 priority account which basically has unique way of proposition towards customers. This internship report covers many important aspects like different product proposed by bank towards customers like (Loans, Fixed deposit etc)

The study is organized into five chapters as the first chapter deals with the introduction of banking sector, brief history of banking and a current scenario of banking sector. In the second chapter profile of select banks is studied, vision and mission, quality policy of the organization, organization structure and functions of different departments, product/service profile, areas of operations, infrastructure facilities, competitors' information. In the third chapter shows the SWOT analysis. Chapter four is devoted to the study of overview of the finance department, in that elaborative information of the department, strategy of the department, no. of employees, their roles and responsibilities. Chapter five is about learning experience and conclusion.

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CHAPTER: I

Introduction about the Banking sector

network and through the National Bank for Agriculture and Rural Development (NABARD) with facilities like microfinance.

Ancient India

The Vedas are the ancient Indian texts mention the concept of usury, with the word kusidin translated as "usurer". The Sutras (700–100 BCE) and the Jatakas (600–400 BCE) also mention usury. Texts of this period also condemned usury: Vasishtha forbade Brahmin and Kshatriya varnas from participating in usury. By the 2nd century CE, usury became more acceptable. The Manusmriti considered usury an acceptable means of acquiring wealth or leading a livelihood. It also considered money lending above a certain rate and different ceiling rates for different castes a grave sin.[13]

The Jatakas, Dharma shastras and Kausalya also mention the existence of loan deeds, called rampart, rabanna, or rnalekhaya.

Later during the Mauryan period (321–185 BCE), an instrument called adesha was in use, which was an order on a banker directing him to pay the sum on the note to a third person, which corresponds to the definition of a modern bill of exchange. The considerable use of these instruments has been recorded. In large towns, merchants also gave letters of credit to one another.

Nationalization in 1969

Despite the provisions, control and regulations of the Reserve Bank of India, banks in India except the State Bank of India (SBI), remain owned and operated by private persons. By the 1960s, the Indian banking industry had become an important tool to facilitate the development of the Indian economy. At the same time, it had emerged as a large employer, and a debate had ensued about the nationalization of the banking industry.[21] Indira Gandhi, the then Prime Minister of India, expressed the intention of the Government of India in the annual conference of the All India Congress Meeting in a paper entitled Stray thoughts on Bank Nationalization.

Thereafter, the Government of India issued the Banking Companies (Acquisition and Transfer of Undertakings) Ordinance, 1969 and nationalized the 14 largest commercial banks with effect from the midnight of 19 July 1969. These banks contained 85 percent of bank deposits in the country. Within two weeks of the issue of the ordinance, the Parliament passed the Banking Companies (Acquisition and Transfer of Undertaking) Bill, and it received presidential approval on 9 August 1969.

The following banks were nationalized in 1969:

- Allahabad Bank (now Indian Bank)
- Bank of Baroda
- Bank of India
- Bank of Maharashtra
- Central Bank of India
- Canara Bank
- Dena Bank (now Bank of Baroda)
- Indian Bank
- Indian Overseas Bank
- Punjab National Bank
- Syndicate Bank (now Canara Bank)
- UCO Bank
- Union Bank of India
- United Bank of India(now Punjab National Bank)

Nationalization in 1980

A second round of nationalizations of six more commercial banks followed in 1980. The stated reason for the nationalization was to give the government more control of credit delivery. With the second round of nationalizations, the Government of India controlled around 91% of the banking business of India.

The following banks were nationalized in 1980:

- Punjab and Sind Bank
- Vijaya Bank (Now Bank of Baroda)
- Oriental Bank of India (now Punjab National Bank)
- Corporation Bank (now Union Bank of India)
- Andhra Bank (now Union Bank of India)
- New Bank of India (now Punjab National Bank)

Later on, in the year 1993, the government merged New Bank of India with Bank. It was the only merger between nationalized banks and resulted in the reduction of the number of

nationalized banks from 20 to 19. Until the 1990s, the nationalized banks grew at a pace of around 4%, closer to the average growth rate of the Indian economy.

Liberalization in the 1990s

In the early 1990s, the then government embarked on a policy of liberalization, licensing a small number of private banks. These came to be known as *New Generation tech-savvy banks*, and included Global Trust Bank (the first of such new generation banks to be set up), which later amalgamated with Oriental Bank of Commerce, IndusInd Bank, UTI Bank (since renamed Axis Bank), ICICI Bank and HDFC Bank. This move – along with the rapid growth in the economy of India – revitalized the banking sector in India, which has seen rapid growth with strong contribution from all the three sectors of banks, namely, government banks, private banks and foreign banks.

The next stage for the Indian banking has been set up, with proposed relaxation of norms for foreign direct investment. All foreign investors in banks may be given voting rights that could exceed the present cap of 10% at present. In 2019, Bandana bank specifically, increased the foreign investment percentage limit to 49%. It has gone up to 74% with some restrictions.

The new policy shook the banking sector in India completely. Bankers, till this time, were used to the 4–6–4 method (borrow at 4%; lend at 6%; go home at 4) of functioning. The new wave ushered in a modern outlook and tech-savvy methods of working for traditional banks. All this led to the retail boom in India. People demanded more from their banks and received more.

Types of Banks: They are given below:

1. Commercial Banks:

These banks play the most important role in modern economic organization. Their business mainly consists of receiving deposits, giving loans and financing the trade of a country. They provide short-term credit, i.e., lend money for short periods. This is their special feature.

2. Exchange Banks:

Exchange banks finance mostly the foreign trade of a country. Their main function is to discount, accept and collect foreign bills of exchange. They also buy and sell foreign currencies and help businessmen to convert their money into any foreign money they need.

Their share in the internal trade of a country is usually small. In addition, they carry on ordinary banking business too.

3. Industrial Banks:

There are a few industrial banks in India. But in some other countries, notably Germany and Japan, these banks perform the function of advancing loans to industrial undertakings. Industries require capital for a long period for buying machinery and equipment. Industrial banks provide this type of Mock capital. Industrial banks have a large capital of their own. They also receive deposits for longer periods. They are thus in a position to advance long-term loans.

4. Agricultural or Co-operative Banks:

The main business of agricultural banks is to provide funds to farmers. They are worked on the co-operative principle. Long-term capital is provided by land mortgage banks, nowadays called land-development banks, while short-term loans are given by co-operative societies and co-operative banks. Long-term loans are needed by the farmers for purchasing land or for permanent improvements on land, while short-period loans help them in purchasing implements, fertilizers and seeds. Such banks and societies are doing useful work in India.

5. Savings Banks:

These banks (perform the useful service of collecting small savings. Commercial banks too run "savings departments" to mobilize the savings of men of small means. The idea is to encourage thrift and discourage hoarding. Post Office Saving Banks in India are doing this useful work.

6. Central Banks:

Over and above the various types of banks mentioned above, there exists in almost all countries today a Central Bank. It is usually controlled and quite often owned by the government of the country.

An efficient banking system is necessary for a country, if it is to progress economically. The services that an efficient banking system can render a country are indeed very valuable. Undeveloped banking system is not only an index of economic backwardness of a country, it is also an important cause of it. The banking system can be useful in the following ways, in addition to what has been mentioned in the functions of banks.

(i) The banks create instruments of credit which are very convenient substitutes for money. This means a great saving Actual movement of money is avoided and expenses saved.

(ii) The banks increase the mobility of capital. They bring the borrowers and the lenders together. They collect money from those who cannot use it, and give it to those who can. Thus, they help the movement of funds from place to place, and from person to person, in a very convenient and inexpensive manner.

(iii) They encourage the habit of habit by providing safe channels of investment. In the absence of banking facilities, people would just squander their funds.

(iv) By encouraging savings, the banks bring about accumulation of large amount of capital in the country from small individual savings. In this way, they make the resources of the country more productive, and thus contribute to the general prosperity and welfare, of the country.

Important Functions of Bank

There are two types of functions of banks:

1. Primary functions – being primary are also called banking functions.
2. Secondary Functions

Both the types of functions of bank are explained below in detail:

Primary Functions of Bank

All banks have to perform two major primary functions namely:

1. Accepting of deposits
2. Granting of loans and advances

Accepting of Deposits

A very basic yet important function of all the commercial banks is mobilizing public funds, providing safe custody of savings and interest on the savings to depositors. Bank accepts different types of deposits from the public such as:

1. **Saving Deposits** encourages saving habits among the public. It is suitable for salary and wage earners. The rate of interest is low. There is no restriction on the number and amount of withdrawals. The account for saving deposits can be opened in a single name or in joint names. The depositors just need to maintain minimum balance which varies across different banks. Also, Bank provides ATM cum debit card, cheque book, and Internet banking facility. Candidates can know about the Types of Cheques at the linked page.
2. **Fixed Deposits:** Also known as Term Deposits. Money is deposited for a fixed tenure. No withdrawal money during this period allowed. In case depositors withdraw before maturity, banks levy a penalty for premature withdrawal. As a lump-sum amount is paid at one time for a specific period, the rate of interest is high but varies with the period of deposit.
3. **Current Deposits**: They are opened by businessmen. The account holders get an overdraft facility on this account. These deposits act as a short-term loan to meet urgent needs. Bank charges a high-interest rate along with the charges for overdraft facility in order to maintain a reserve for unknown demands for the overdraft.
4. **Recurring Deposits:** A certain sum of money is deposited in the bank at a regular interval. Money can be withdrawn only after the expiry of a certain period. A higher rate of interest is paid on recurring deposits as it provides a benefit of compounded rate of interest and enables depositors to collect a big sum of money. This type of account is operated by salaried persons and petty traders.

Granting of Loans & Advances

The deposits accepted from the public are utilized by the banks to advance loans to the businesses and individuals to meet their uncertainties. Bank charges a higher rate of interest on loans and advances than what it pays on deposits. The difference between the lending interest rate and interest rate for deposits is bank profit.

Bank offers the following types of Loans and Advances:

1. **Bank Overdraft**: This facility is for current account holders. It allows holders to withdraw money anytime more than available in bank balance but up to the provided limit. An overdraft facility is granted against collateral security. The interest in

overdraft is paid only on the borrowed amount for the period for which the loan is taken.

2. **Cash Credits:** a short-term loan facility up to a specific limit fixed in advance. Banks allow the customer to take a loan against a mortgage of certain property (tangible assets and / guarantees). Cash credit is given to any type of account holders and to those who do not have an account with a bank. Interest is charged on the amount withdrawn more than the limit. Through cash credit, a larger amount of loan is sanctioned than that of overdraft for a longer period.
3. **Loans:** Banks lend money to the customer for short term or medium periods of say 1 to 5 years against tangible assets. Nowadays, banks do lend money for the long term. The borrower repays the money either in a lump-sum amount or in the form of installments spread over a pre-decided time. Bank charges interest on the actual amount of loan sanctioned, whether withdrawn or not. The interest rate is lower than overdrafts and cash credits facilities.
4. **Discounting the bill of exchange:** It is a type of short-term loan, where the seller discounts the bill from the bank for some fees. The bank advances money by discounting or purchasing the bills of exchange. It pays the bill amount to the drawer(seller) on behalf of the drawee (buyer) by deducting usual discount charges. On maturity, the bank presents the bill to the drawer or acceptor to collect the bill amount.

Secondary Functions of Bank

Like Primary Functions of Bank, the secondary functions are also classified into two parts:

1. Agency functions
2. Utility Functions

Agency Functions of Bank

Banks are the agents for their customers; hence it has to perform various agency functions as mentioned below:

Transfer of Funds: Transferring of funds from one branch/place to another.

Periodic Collections: Collecting dividend, salary, pension, and similar periodic collections on the clients' behalf.

Periodic Payments: Making periodic payments of rents, electricity bills, etc. on behalf of the client.

Collection of Cheques: Like collecting money from the bills of exchanges, the bank collects the money of the cheques through the clearing section of its customers.

Portfolio Management: Banks manage the portfolio of their clients. It undertakes the activity to purchase and sell the shares and debentures of the clients and debits or credits the account.

Other Agency Functions: Under this bank act as a representative of its clients for other institutions. It acts as an executor, trustee, administrators, advisers, etc. of the client.

Utility Functions of Bank

- Issuing letters of credit, traveler's cheque, etc.
- Undertaking safe custody of valuables, important documents, and securities by providing safe deposit vaults or lockers.
- Providing customers with facilities of foreign exchange dealings
- Underwriting of shares and debentures
- Dealing in foreign exchanges
- Social Welfare programmes
- Project reports
- Standing guarantee on behalf of its customers, etc.

Small finance Bank:

In India, where extending banking services to the underserved and unserved sections of the population is a challenge, there is merit in considering access to bank credit and services through expansion of small banks in unbanked and under-banked regions.

In India an experiment with small banks was taken up following an announcement made by the then Finance Minister in the Union Budget in August 1996 and the RBI issued guidelines for setting up of Local Area Banks (LABs) vide its Press Release dated August 24, 1996. The LABs were conceived as low-cost structures which would provide efficient and competitive financial intermediation services in a limited area of operation, i.e., primarily in rural and semi-urban areas. LABs were required to have a minimum capital of Rs. 5 crore and an area

of operation comprising three contiguous districts. Presently, four LABs are functioning satisfactorily.

Taking into account the above and that small finance banks can play an important role in the supply of credit to micro and small enterprises, agriculture, and banking services in unbanked and under-banked regions in the country, the RBI has decided to license new "small finance banks" in the private sector. While permitting small banks, however, the issues relating to their size, capital requirements, area of operations, exposure norms, regulatory prescriptions, corporate governance, and resolution need to be suitably addressed in the light of experience gained. Hence RBI has come out with following guidelines for licensing of small finance banks in the private sector.

Operational SFBs in India:

Some of the operational Small Finance Banks in India are as follows.

1. Ujjivan Small Finance Bank.
2. Janalakshmi Small Finance Bank.
3. Equitas Small Finance Bank.
4. A U Small Finance Bank.
5. Capital Small Finance Bank.
6. ESAF Small Finance Bank.
7. Utkarsh Small Finance Bank.
8. Suryoday Small Finance Bank.
9. Fincare Small Finance Bank.

Chapter: 2

Organization profile:

INTERNSHIP AT FINCARE SMALL FINANCE BANK

The journey of Fincare Small Finance Bank was in the process of coming together with 2 NBFC Micro Finance Institutions, Future Financial Services Private Limited and Disha Microfin Private Limited received the Final License from the RBI under Section 22 of the Banking Regulation Act, 1949 to Release Banking Operations in May 2017. The Bank commenced its operations on 21st July 2017, with a view to enabling financial inclusion. And the pyramid of the underbanked base, the affluent of the mass retail and micro and small enterprise segments. In the first quarter of FY20, Fincare Small Finance Bank was included in the Second Schedule of the Reserve Bank of India Act, 1934. By virtue of this, our bank is now a Scheduled Commercial Bank, a status that reflects the highest degree of trust and good governance. Fincare Small Finance Bank has a suite of smart banking products such as Savings Accounts, Current Accounts, Fixed Deposits, NRI Fixed Deposits, Recurring Deposits, Micro Loans, Cash Overdraft, Loans against Gold, Loan Against Property, Institutional Finance and Two - Wheeler Loan. Since inception, the digital paradigm has always been the force multiplier that would enable us to emerge as a best - in - class player in the banking landscape in India. We recognize digital as the currency that is going to radically change India's future and in particular banking. With a 3D approach viz. Digital, doorstep and delightful rates, we are confident of becoming a force to reckon and a 'Smart Bank if choice' in India.

1995- Incorporation of our Bank

2010- There bank was registered as a NBFC-ND with the RBI under the name of 'Disha Microfinance Private Limited'

2013- There bank, then known as Disha Microfinance Private Limited, was registered with the RBI as NBFC-MFI

2015- Fincare bank, then known as Disha Microfinance Private Limited received RBI in-principal approval to convert into a small finance bank

2016- The name of 'Disha Microfinance Private Limited' was changed to 'Disha Microfinance Limited' upon conversion into a public company

2017- our Bank received RBI license to carry on the business of a small finance bank. The name of our Bank was changed to 'Fincare Bank Limited'

2019- Crossed 1.7 million active customer bases.

Way of the Fincare Bank:

- Customer-centric approach driven by digital banking and automation.
- Strong commitment to financial inclusion with extensive rural franchise and expanding urban presence.
- Multi-channel, low-cost distribution network with diversified geographic presence.
- Fast-growing stable deposit base with a growing CASA franchise.
- Stable and experienced professional leadership team with strong corporate government.
- Robust risk management policies, leading to healthy asset quality.
- Strong track record of financial and operational performance.

Profile of the organization

Fincare Small Finance Bank Limited provides lending services. The company offers mortgage, insurance, credit, loan sanction, and disbursement services. Fincare Small Finance Bank serves customers in India.

Sector: Financials

Industries: banking

Sub-Industry: Banking

Incorporated: 04/05/1995

Address: 5th Floor, Bren Mercury Kaikondanahalli, Sarjapur Main Bangalore, 560102 India

Phone: 91-80-4250-4444 Website: www.fincarebank.com

Executives:

1. Keyur Doshi- Chief Financial Officer- Present Board Member [2017] Disha Microfinance Pvt. Ltd
2. Soham Shukla- Chief Operating Officer- Present [1997]
3. Nilesh Sangoi- CDO/Head: Data Analytics- Present [2020]

Company Description:

Fincare Business Services Limited was incorporated on 5th August 2014, as a Private Limited Company with its registered Office at Bangalore, Karnataka. In 2016, Fincare Business Services Limited was converted into a Public Limited Company and transited to a non-Deposit taking Systematically Important- Core Investment Company [CIC-ND-SI] vide RBI

Certificate of Registration dated 2nd February 2017 with its main objective of providing loans to its subsidiary Company, i.e., Fincare Small Fincare Bank Limited, and other group Companies.

Portfolio:

Fincare Small Finance Bank is a new age retail bank with 'Urban' focus built on trust, technology, and transparency. The Bank became operational in May 2017, upon receipt of the final license of the Reserve Bank of India under Section 22 of the Banking Regulations Act 1949. The Bank commenced its banking operations on 21st July 2017 with a vision to enable the financial inclusion of unbanked and under banked customers with the active participation of the more affluent segments. The Bank has its registered office at Ahmadabad, Gujarat and its Corporate Office is located at Bangalore, Karnataka. In the first quarter of 2020, the Bank was included in the Second Schedule of Reserve Bank of India Act, 1934 and by virtue of which the Bank is now a Scheduled Commercial Bank, a status that reflects the highest degree of trust and good governance.

Vision and Mission of the Bank

Vision: To be the leading digitized bank of an aspiration India serving all customers and communities.

Mission: To be the trusted and inclusive bank with consistently high standards of performance, compliance, and work culture.

Quality policy of the organization

Since 2005, India has actively pursued the policy of financial inclusion. As part of this policy, the Reserve Bank has undertaken a number of measures, which among others, include opening bank branches in unbanked areas, roping in business correspondents and facilitators for ensuring last mile connectivity of banking, and opening small business accounts linked to debit cards to promote financial inclusion along with financial literacy. The introduction of Board-approved financial inclusion plans in 2010 has given a definite direction and structure to the efforts for financial inclusion. The alignment of the financial inclusion plan objectives with those laid out as part of the Pradhan Mantri Jan-Dham Yojana in 2014 has imparted a mission mode to these efforts.

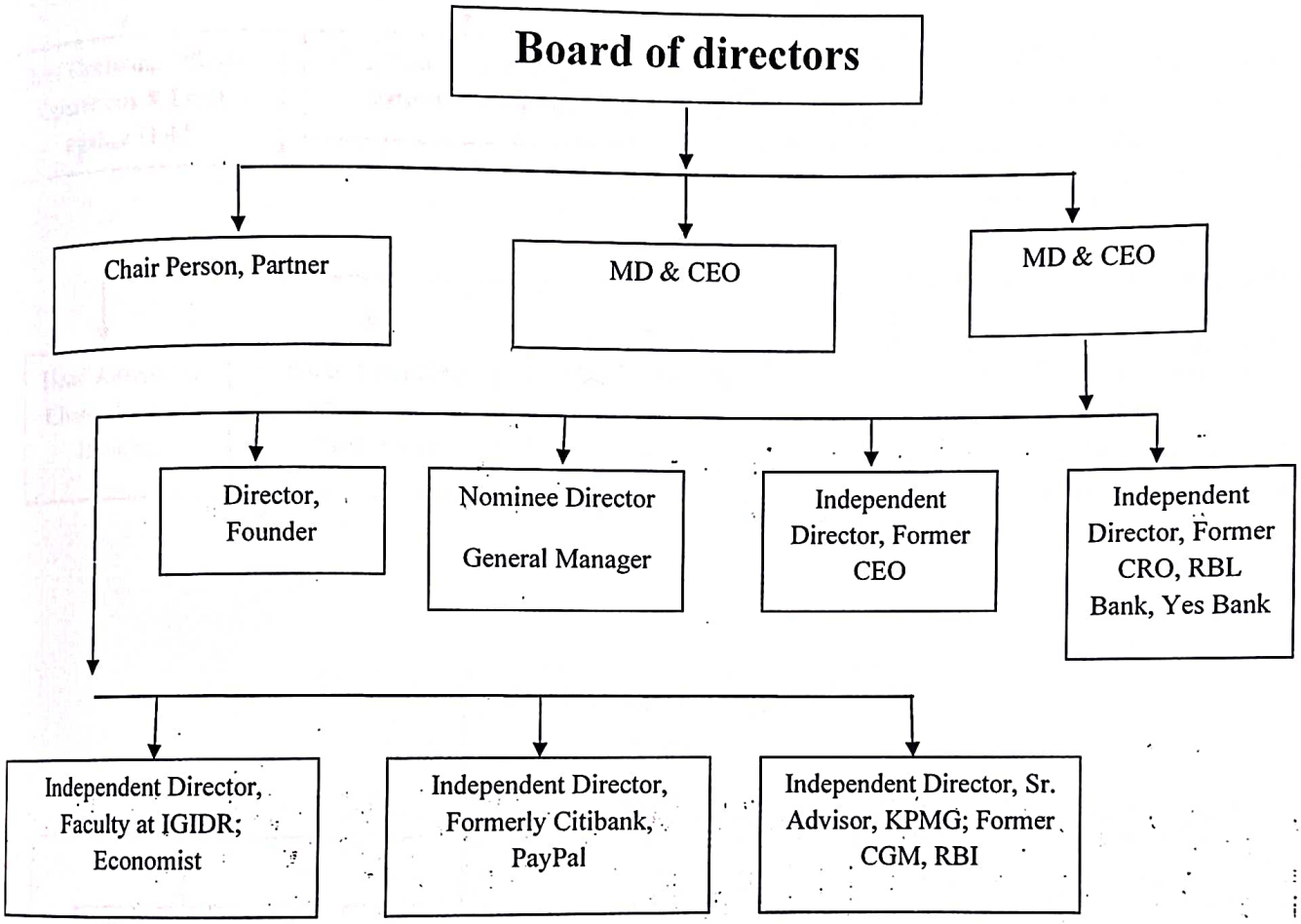
A Brief Overview of the Regulatory Guidelines for SFBs, which operate as SCBs, are subject to the prudential regulatory norms similar to other SCBs. However, being differentiated in their nature of business, there are certain differences. Some of these differentiated guidelines for SFBs are as follows: (i) Being a differentiated or niche bank, the minimum net worth for an SFB has been fixed at a lower level than other SCBs. SFBs need to have a minimum net worth of `2 billion (increased from `1 billion following the issuance of the guidelines for on-tap licensing for these banks), as compared to `5 billion for other SCBs.

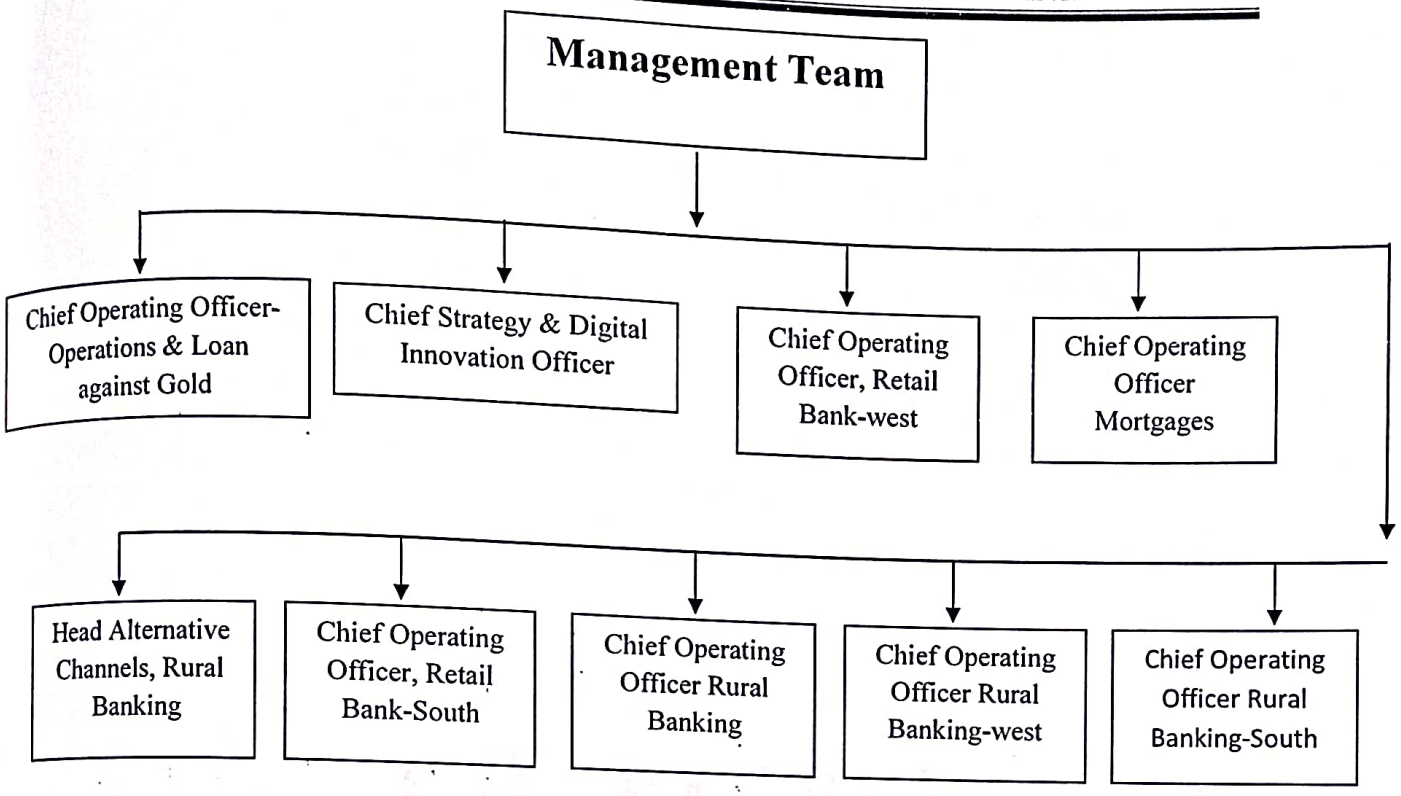
(ii) Considering their focus on financial inclusion, SFBs have to provide at least 75 per cent of their Adjusted Net Bank Credit (ANBC) to priority sectors as compared to 40 per cent in the case of other SCBs (excluding RRBs).

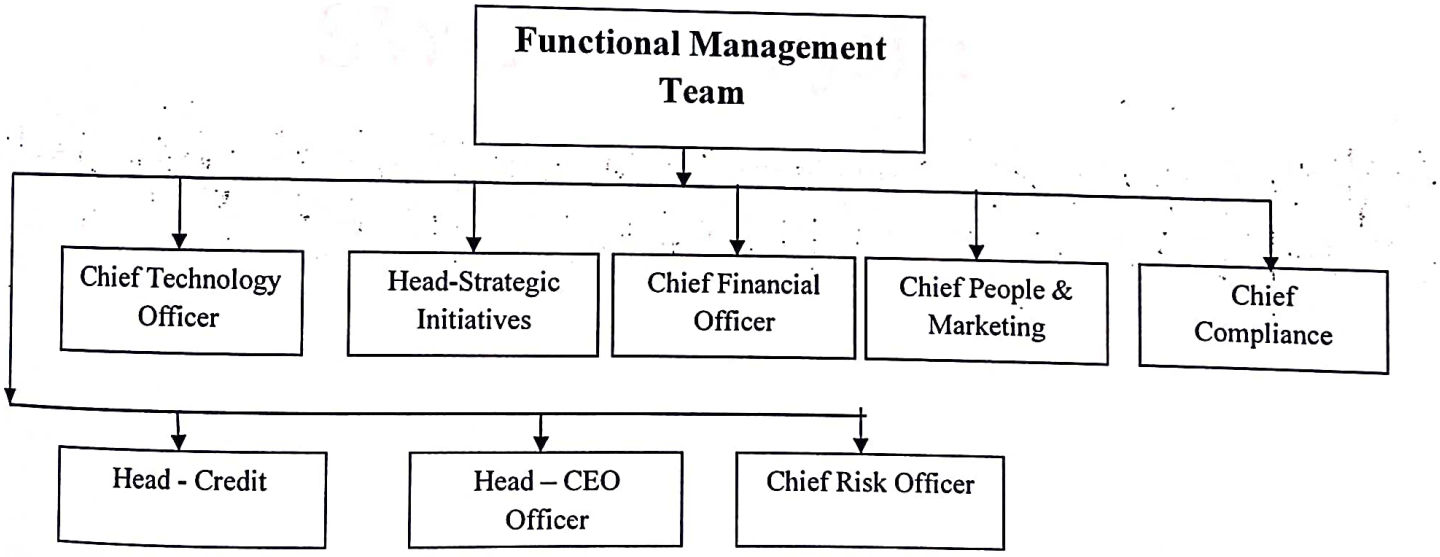
(iii) Considering their focus on small-sized credit, at least 50 per cent of their loan portfolio should comprise loans of up to 25 lakhs.

(iv) In view of the inherent business risks, the minimum Capital to Risk-weighted Assets Ratio (CRAR) for SFBs has been fixed at 15 per cent.

STRUCTURE OF THE BANK




Management Team
Chief Operating Officer-Operations & Loan against Gold
Chief Strategy & Digital Innovation Officer
Chief Operating Officer, Retail Bank-west
Chief Operating Officer Mortgages
Head Alternative Channels, Rural Banking
Chief Operating Officer, Retail Bank-South
Chief Operating Officer Rural Banking
Chief Operating Officer Rural Banking-west
Chief Operating Officer Rural Banking-South


Functional Management Team
Chief Technology Officer
Head-Strategic Initiatives
Chief Financial Officer
Chief People & Marketing
Chief Compliance
Head - Credit
Head – CEO Officer
Chief Risk Officer

CHAPTER: 3

SWOT Analysis:

1. **Strengths:**

- Free Banking Transactions.
- Avail limited free banking services for transactions.
- Seamless Fund Transfer.
- Transactions at your fingertips through Internet and Mobile banking.
- It has zero debit card maintenance and 8 free ATM transactions.
- It also has mobile banking, WhatsApp banking transactions.

2. **Weakness:**

- Technical issues while, creating account through mobile.
- Some people may not be having fan card, so that may make bit difficult to open account.

3. **Opportunities:**

- It should provide more promotion activities.
- It can also create online saving account.
- Increasing high tare of interest on deposits.
- It can expand its small Fincare bank ranches especially in rural areas.

4. **Threats:**

- Technology management.
- While changing its organization structure and business plans, risk may arise.

FUNCTIONS OF DIFFERENT DEPARTMENTS

HR functions:

1. In FY20, the Bank made remarkable progress in building a best-in-class institution driven by its most treasured capital – its people. The People function of the Bank provides multiple services to its internal customers, ranging from talent acquisition to talent engagement, training & development, performance management, compensation and benefits, HR helpdesk. A robust HR portal combined with a mobile App, helps drive majority of the HR processes such as attendance and leave management, recruitment and on boarding activities, performance.

2. The HR team is committed to fairness and transparency in HR processes and continuously engages with all functional heads in providing speedy and quality HR support. In FY20 the Bank's headcount increased from 5,537 to 7,363. The workforce is categorized as business and corporate functions, with Business functions accounting for 77% of staff during the year.

3. This local-hiring strategy enhances our ability to serve our customers at their doorstep and in the language that makes them feel comfortable. And as an engagement initiative, the Bank conducts HR Days across all offices, banking outlets. Such forums are a means for communicating culture, spreads awareness about employment benefits, policies and practices, rewards and recognition programmers.

4. The Bank invests in enhancing knowledge and skill through training programmes – both internal and external, both through classroom and e-learning channels – and hosting business immersion and field visits.

HR trends

Diversity: One of the HR trends in the financial sector is increasing diversity. Previously, the finance sector has been male dominated. Now, the financial industry is focusing on drawing in more bright young females with the potential to reach senior levels in the company. There are more and more initiatives in place now to make this happen. For example, the **Big Four firms of the financial sector (PricewaterhouseCoopers, Ernst & Young, KPMG and Deloitte) run a number of events to encourage and promote diversity. The bank BNP Paribas has started up its own 'Diversity Week'.** This trend towards diversity implies that HR managers in

financial firms are often involved in events, presentations and online discussions. They need to come up with creative ways to reach out to target diverse groups. Then to encourage them to apply for the company and aspire for more senior roles there. They must then ensure there are the provisions in place to help them to achieve that.

Advancing Technologies: Another trend in this industry is the advancing technology, there's no escaping this. It influences the sector in so many areas. The internet and social media have had a huge impact on the way many financial firms interact with their customers. The more complex jobs are safe, but it's common for lower value operations to be replaced by automation.

One big change that has affected this industry in the last few years is increasing threats from the world of the internet. In recent years we have witnessed countless incidents of the online operations of financial firms being exploited at the hands of hackers and phishes. Bank account and credit card details of thousands of customers of some banks have been stolen by hackers, this has delivered heavy blows to the repute of the banks. The danger of data theft makes way for relatively new entrants to this industry, cyber security specialists. Cyber security now is of utmost importance to banks and financial firms and requires a new set of skills to be included when HR is looking for employees.

Digitalization: Like the rest of the world, the banking and finance sector is also shifting towards digitalization. Not only in the affairs of the office, but also the client. Bank interaction is becoming increasingly digital. People tend to pay their bills and transfer funds using mobile banking instead of taking the tedious journey to the bank and then wait in lines. Anticipating this trend, HR teams are now focusing on hiring employees that are going to help develop the mobile banking service rather than those who sit in the banks 9 to 5 and work on paper. Full-time bankers such as receptionists, tellers and managers are still needed because a segment of the population still prefers to make and receive their payments in hard cash.

Retention: Jobs at financial firms are notoriously unpopular because of their monotonous and boring work schedule. Often bankers leave their high paying jobs and start working elsewhere. This is just because they found their job boring and unchallenging. This is a challenge faced by HR teams. They have to work to change the way bank workers perceive their jobs. HR teams are focusing on making the offices more fun by introducing Gasification. As well as presenting situations where employees feel more passionate about their work.

Marketing functions:

1. Micro loans: Income generation loans primarily for women customers from low-income rural households. Ticket size ranges from ₹ 15,000 to ₹ 45,000 with tenure of 24 months.

2. Loan against property: Business loans primarily for micro and small business owners in semi-urban and urban markets and used for business expansion, asset purchase and debt consolidation. Ticket size ranges from ₹ 1, 50,000 to ₹ 50, 00,000 with tenure of 36-120 months.

3. During the year, Fincare Small Finance Bank redefined its brand positioning with the launch of the 'Wish More, Get More' campaign. With this theme, the Bank positioned itself as the, friendly, wise, trust-worthy service provider, who understands the importance of financial goals, helps access products and services suited to one's needs, runs operations in a smooth, efficient, and compliant manner, is fair and transparent in dealings and on top of that, has good tech-understanding and finally, all of it comes together in the form of a helping hand that lets you achieve your financial goals.

4. The success of the campaign inspired the Bank to widen its product basket and make the best use of its digital edge. The Bank's marketing campaigns played a significant role in deepening the customer connect using multiple platforms

5. Product/Service Launch: These involve campaigns, PR outreach, customer awareness programmes, and advertorials in the print media, social media and radio. During the year, 9 product/service launches

6. Below the Line (BTL) Activities: These involve activities in catchment zones for generating leads, conducting door-to-door campaigns, hosting festival linked contests, community get-togethers and wellness campaigns. During the year 136 BTL activities were undertaken across India, were covered by marketing activities.

7. Brand and product films, in FY20, the bank hosted a book launch event at Mumbai for our Brand Ambassador, Mr. Viswanathan Anand. He also graced our corporate office and participated in an employee engagement event, much to the delight of the team.

Finance functions:

1. The Finance function is the fulcrum of smooth business operations of the Bank and involves a broad range of activities supporting internal stakeholders and external stakeholders.

2. At the Bank, the Finance function ensures efficient and effective day to day Finance Operations, Regulatory Reporting, Statutory Compliances, Management Reporting, Direct and Indirect Taxation, Financial Planning and Analysis, Treasury Management, Funds Raising, Cash flow Management and Investor Relations. The Bank has a well-defined Finance Function structure with dedicated teams to m

3. The Finance Function performs regular operations, prepares and reviews the periodical financial statements with an endeavor to make continuous process improvements, with adherence to all required accounting policies, practices, compliance and regulatory guidelines, an age respective activity.

4. Overall, the Treasury Function ensured adequate liquidity with robust cash flows and managed the relationship with prospective lenders and remained focused on a proper mix between borrowing and lending.

PRODUCT/ SERVICE PROFILE

1. Micro loans: Income generation loans primarily for women customers from low-income rural households. Ticket size ranges from ₹ 15,000 to ₹ 45,000 with tenure of 24 months.

2. Loan against property: Business loans primarily for micro and small business owners in semi-urban and urban markets and used for business expansion, asset purchase and debt consolidation. Ticket size ranges from ₹ 1, 50,000 to ₹ 50, 00,000 with tenure of 36-120 months.

3. Loan against gold Short-term liquidity loans, primarily for micro-enterprises and self-employed individuals in semi-urban and urban markets. Ticket size ranges from ₹ 5,000 to ₹ 25, 00,000 with tenure of 3-24 months.

4.Institutional finance Loans backed by hypothecation of receivables, primarily targeted at NBFCs and NBFC-MFIs for onward lending, and MSMEs. Ticket size ranges from ₹ 1 Crore to ₹ 15 Crore with a tenure of 6-36 months.

5.Two-wheeler loan for purchase of two-wheeler, primarily for existing Microloan's customers. Ticket size ranges from ₹ 22,000 to ₹ 75,000 for tenure of 24-36 months.

6.**Savings account: The** account offers interest rate of 6% p.a. for balances up to ₹ 1 Lakh, 7% p.a. for balances over ₹ 1 Lakh, 7.25% p.a. for balances over ₹ 5 Crore and 7.5% p.a. for balances over ₹ 20 Crore. Interest is paid monthly. The offering is targeted at retail mid and affluent segments, small businesses, and TASC segment and microloan customers.

7. 101 savings accounts: A digital savings account with two variants: 101 First and 101 Priority. The account offers interest rate of 6% p.a. for balances up to ₹ 1 Lakh, 7% p.a. for balances over ₹ 1 Lakh. Interest is paid monthly. The offering is targeted at Digital Savvy, High Earners, Not Rich Yet (HENRY) segment.

8. Current account: It offers facilities like 24/7 cash deposit anytime, anywhere at Fincare ATM, Up to 100 free transactions across NEFT, RTGS & IMPS for premium variant, 15 free transaction per month across all ATM and Unlimited cash transactions at branch for premium variant and sweep facility. It is targeted towards small and medium businesses.

9. Recurring deposit: It offers interest rate of 9% p.a. The minimum deposit amount starts at ₹ 500 and the tenure of the deposit can vary from 6 months to 5 years.

10. Retail term deposit: The product offers interest rates up to 9% p.a. with additional 0.5% p.a. for senior citizens. The ticket size is up to ₹ 2 Crore. Interest is paid on monthly/quarterly basis or reinvested. The product is targeted at retail, mid and affluent customers.

11. Institutional deposits: The product is targeted at corporate, institutional and high net-worth individual investors. Ticket size is ₹ 2 Crore and above. Interest is paid on monthly/quarterly basis or reinvested. The product is targeted at corporate, institutional, and high net-worth individual investors.

Financial responsibilities: Reports and Assists the Chief Operation Officer in meeting the Real Estate, Projects and Facility Management targets in line with the market standards.

Non-Financial Responsibilities: Expertise in handling Real Estate Management, Infrastructure Projects and Facility Management for PAN India Branches, Regional & Corporate Office. Hands on and rich experience in managing and controlling budgets, inclusive of negotiations and end mile closures. Responsible for running against time to

handle, source and close the real estate transactions of the region. Expanding and managing a litigation free portfolio for the zone. Ensuring delivery of projects within the agreed timeline as per the quality, cost and other relative delivery parameters standardized by the bank. Should be capable of no crunching and data analysis for getting and overall control of the portfolio. Should be responsible for establishing the good practices in the region with high integrity values. Should be responsible for a establishing, directing and controlling the team for a timely executions. Should have the technical capability to understand the finer points of contracts and all vendor engagements from projects, facility management, security and projects perspective Capability to do internal and external vendor management along with exposure to manage the senior management engagements.

AREA OPERATIONS

In India an experiment with small banks was taken up following an announcement made by the then Finance Minister in the Union Budget in August 1996 and the RBI issued guidelines for setting up of Local Area Banks (LABs) vide its Press Release dated August 24, 1996. The LABs were conceived as low-cost structures which would provide efficient and competitive financial intermediation services in a limited area of operation, i.e., primarily in rural and semi-urban areas. LABs were required to have a minimum capital of Rs. 5 crore and an area of operation comprising three contiguous districts. Presently, four LABs are functioning satisfactorily.

Taking into account the above and that small finance banks can play an important role in the supply of credit to micro and small enterprises, agriculture, and banking services in unbanked and under-banked regions in the country, the RBI has decided to license new "small finance banks" in the private sector. While permitting small banks, however, the issues relating to their size, capital requirements, area of operations, exposure norms, regulatory prescriptions, corporate governance, and resolution need to be suitably addressed in the light of experience gained. Hence RBI has come out with following guidelines for licensing of small finance banks in the private sector.

Customer centricity is at the heart of everything we do, and Branch Operations unit follows the same mantra. This unit is responsible is responsible for all day-to-day operations at the Banking outlets, covering aspects such as customer service, deposit and loan documentation

handling, security, branch administration and safety procedures in accordance with the guidelines.

The activities include reviewing and monitoring account opening and closure, handling FD and RD maturity and renewals, scrutinizing and verifying customers' requests and complaints, among others. In FY19, the Branch Operations unit delivered strong operational controls across branches with near Zero cash losses at banking outlets. Customer complaints received in this period were also minimal.

INFRASTRUCUTRE FACILITIES

1. The Bank's Facilities framework is built on tight controls, process-orientation and competitiveness in order to cater to diverse and growing business segments. During FY19, the facilities unit achieved swift and cost-effective branch infrastructure roll out, without compromising on excellence and quality. In FY19, the Bank expanded its geographical footprint to 5 new States/ Union Territories including Telangana, Uttar Pradesh, Haryana, and Delhi – NCR and Kerala and added 149 banking outlets.
2. Fincare Small Finance Bank has adopted a multi-site CPC structure for efficient coverage across multiple geographies and states.
3. The Centralized Processing Centre (CPC) is tasked to bring standardization in processes to deliver a uniform customer experience. Built on "Go Digital, Enable Business, and Create Value" motto, the CPC unit handles the back end for the entire suite of assets, liabilities and third-party products. It also provides valuable support for completion of the overall end-of-day activities with respect to financial and business operations.
4. The unit covers CTS (Cheque Truncation System), RTGS, NEFT and all electronic payments, thus ensuring superior delivery of compliance guidelines and customer expectations. The unit also covers Term Deposit, Loan Disbursement and Reconciliation - ATM, POS, IMPS, and Utility Bill Pay & Settlement of GL (Gold Loan) Accounts.
5. The CPC facilitated Aadhaar seeding of over 3 Lakh accounts through NPCI during the year. And the Bank has a toll-free, multi-site contact center that handles both inbound and outbound calls to customers. It offers 7 language options to address a diverse customer base. All centers are equipped to handle enquiries, service requests and complaints, along with internal service level agreements.

Competitor's information

- Equitas Small Finance Bank
- AU Small Finance Bank
- Capital Small Finance Bank
- Equitas Small Finance Bank
- AU Small Finance Bank
- Capital Small Finance Bank

STRATEGY OF THE DEPARTMENT

The Bank's Digital Philosophy is built on drivers such as user experience, seamlessness across channels and scale. At our Bank, every aspect of banking operations, including customer on boarding, backend process workflows, risk management and compliance is driven by a digital-first philosophy. The 101-account offering from our Bank places us among the frontrunners in the Banking sector, offering the convenience of savings account services through the digital channel.

This local-hiring strategy enhances our ability to serve our customers at their doorstep and in the language that makes them feel comfortable. As an engagement initiative, the Bank conducts HR Days across all offices, banking outlets. Such forums are a means for communicating culture, spreads awareness about employment benefits, policies and practices, rewards and recognition programmes

Digital strategy:

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communicating culture, spreads awareness about employment benefits, policies and practices, rewards and recognition programmes.

1. **Community Marketing**

Banks range in size and capabilities, so banking business development will vary from market to market. Small banks may only have one or two branch offices whereas large commercial banks may have thousands of branches across the nation. Regardless of the size of the bank, each branch needs to tailor local marketing strategies to serve the immediate community. Consumers bank in a place where they feel safe and comfortable. This means tellers and account representatives who speak English as well as any prominent language in the community. By having branch managers look at the local community needs, the bank can attract a larger percentage of the target market.

2. **Product Bundling**

A successful strategy employed by all banks is product bundling, such as offering a free checking account for those who open a savings account, according to Bank Systems & Technology. Because this has become common practice, successful strategies implement creative bundling solutions. An automatic home line of credit with a mortgage refinance might be a solution when interest rates are low or the community has a large percentage of consumers looking to consolidate debt.

3. **Pre-Approved Products**

Consumers are more likely to say yes to something when they already know they are approved for it, including pre-approved products that pop up on a computer screen, according to The Financial Brand. Banks can review existing accounts to determine positive banking and credit trends in customers. Those identified with positive trends and credit history are sent "pre-approval" letters for credit cards, lines of credit or mortgages.

4. **Teller Referrals**

Bank tellers interact with the majority of the bank clientele. Tellers perform the day-to-day transactions, such as cashing checks, making deposits or transferring money. Successful banks consistently train tellers to look for opportunities to cross-sell bank products and refer customers to the right person. A teller may see a regular customer cash a dividend check and refer the person to the investment specialist. The teller may see a high savings balance and

suggest a higher-earning time certificate. Smart banks reward top referring tellers to entice them to take the time to suggest a new product or service.

5. **Premier Services**

Premier services are designed to attract high net worth bank clientele; this is an effective strategy to increase bank deposits. High net worth clients often have different needs as well as expectations. By offering a select set of private bankers to personally handle all transactions and account reviews, client trust increases. Service is often better with private bankers able to focus on finding the best solutions to fit complete financial scenarios.

Roles and responsibilities of employees:

Roles of employees:

1. **Job Role of Branch Manager**

- The Branch Manager is personally responsible / accountable for achieving targets fixed on various business areas as per the annual performance budget / business plan/ MOU of the branch with the active co-operation of the staff.

- The Branch Manager is 'Man on the Spot' and has to understand the entire operations of the branch.

2. **Customer Service**

- Maintain a high level of customer satisfaction by a. ensuring exemplary customer service. b. attending to customer complaints received directly or online or through Corporate Office / RBI etc. Job Role/Duties of Employees

- Conducting Joint Customer Service Committee meetings regularly. d. meeting the customers on the appointed day and time every month.

3. **Credit portfolio**

- Efficient management of credit portfolio of the branch a. exercise due diligence while extending the loan proposal viz. verification of CIBIL etc. b. sanction of loans / advances under his discretionary powers as per corporate guidelines

 Recommending sanction of loans and advances to higher authorities after due processing of the credit proposal, compilation of credit report of borrowers and guarantors

 Proper documentation as per sanction ticket/Documentation Manual/ Circulars/ Corporate guidelines amended from time to time in case of VLBs and ELBs the function can be delegated to Manager/ SM/ CM (Credit) with proper controls.

Filing of charges with Registrar of companies and creation of mortgage and other charges over borrower's assets. Registration of Equitable mortgage wherever applicable as per State laws to be ensured. Creation of Security Interest in CERSAI portal to be ensured in respect of Immovable's and Movables mortgaged to the Bank.

4. HR Management

 Proper HR management by a. monitoring punctuality, attendance, Leave and discipline to enforce Corporate Office guidelines.

 Reporting of unauthorized absence of staff to Zonal and Corporate Office.

 Proper work allocation and periodical rotation of staff, on half yearly basis, by recording the same.

 Identification of training needs, counseling, adhering to grievance procedure given by CO, conducting periodical staff meetings and submission of its minutes to Zonal office.

 Following Corporate Office/Zonal Office guidelines in meeting extra ordinary situations like strike, floods, bomb scare etc.,

 Keeping open the branches during strike period and ensuring that normal transactions are carried out. g. Periodical perusal of transactions in staff accounts to check for unusual activities

Taking prompt and appropriate action on any complaints received from customers against any staff.

Responsibilities of employees:

Bank Tellers

When an individual walks into a bank, odds are the first person to greet the visitor will be a teller. Tellers provide direct service to customers by accepting deposits, cashing checks and exchanging currency, according to Indeed. This bank employee's typical duties also include receiving check orders from customers and providing traveler's checks. Tellers need excellent math skills to ensure accuracy in handling money. They are required to tally their cash drawers at the beginning and end of the workday.

Customer Service Representatives

Customer service representatives assist customers in opening new bank accounts, modifying existing accounts, and completing paperwork for products such as Certificates of Deposit. Additional duties include answering questions about the bank's products and services and responding to customers' questions. Customer service representatives may also be responsible for answering phone calls, assisting callers or connecting them with the proper department.

Bookkeepers and Clerks

Accounting, auditing and bookkeeping clerks maintain financial records for the bank by posting financial transactions using computer software. These clerks check records for accuracy, reconcile entries and balances and create reports from the data. For example, an accounting clerk may regularly produce balance sheets for management from the bank's financial data. In smaller banks, a bookkeeper may be responsible for all the financial institution's records. Larger banks may split the duties between accounting and auditing clerks.

Loan Officers

Bank staff duties and responsibilities include funnelling loan candidates to the loan officers. Bank loan officers meet with applicants and help them complete loan applications. Loan officers answer questions about the different loan types the bank offers and explain contract provisions. Once the application is completed, loan officers verify the information and evaluate the applicant's potential to satisfy the loan terms. In some financial institutions, loan officers make the final decision on loan approval or denial.

Chapter 4:

Learning Experience and Conclusion

I have undergone-day training program, where they have given the introduction about their Fincare bank and its products and those products are proposed to rural as well as urban customers and where i have approached the customers to open their accounts in Fincare. As there are 2 types of accounts for different types of customers according to their income, one is 101 saving account and another one is general account and also, I have given solutions to their queries regarding opening the account in Fincare. I have worked on "Net promoter score" [NPS], where it will measure the customer's loyalty towards bank, satisfaction and their loyalty towards their banks. And on the bases of customer's feedback and NPS calculation, banks can improve their performance and its customer's services. And here by subtracting the percentage of detractors from the percentage of promoter's yield, we will get net promoter score. So, with the help of these, we can make financial forecast and development of the banks.

Last week, I have framed questionnaires and then, I collected feedback from the customers by using Google forms on the bases of customer's feedback where I have analyzed and interpret the data, regarding net promoter score. and from the data, I have written findings, and gave suggestions to the organizations. And also, at the end of the report conclusion for the project.

I gave some suggestions to Fincare banks for their improvement

1. It Should Provide Flexible Loan Structure with Less Interest as the structure of interest rate is more as compared with other banks.

2. Bank Should Concentrate more on Promotions Activities as most of the rural people are unaware about the bank.

3. Bank should create more awareness regarding 101 Digital Saving Account in Rural Areas as its beneficiary for the rural people.

4. Technology Services has to be Improved, while opening the accounts there will be more glitches which is very difficult to continue the process of opening the account.

5.Bank Should Build a Trust to customers that bank was worthy.

Conclusion:

In our country, currently we are having a well-developed banking system with different classes of banks – public sector banks, foreign banks, private sector banks – both old and new generation, regional rural banks and co-operative banks with the Reserve Bank of India as the leader of the system. The Net Promoter Score is simple tool that businesses can use to measure customer satisfaction. The number of companies using this tool to proves that it is effective. And also, we did study on NPS, and also came to know that different customers feedback from different bank's and also at the end gave some suggestions that what are all the things should be improved after evaluation of NPS.

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https://www.fincarebank.com/investors-relations

https://www.fincarebank.com/about-us

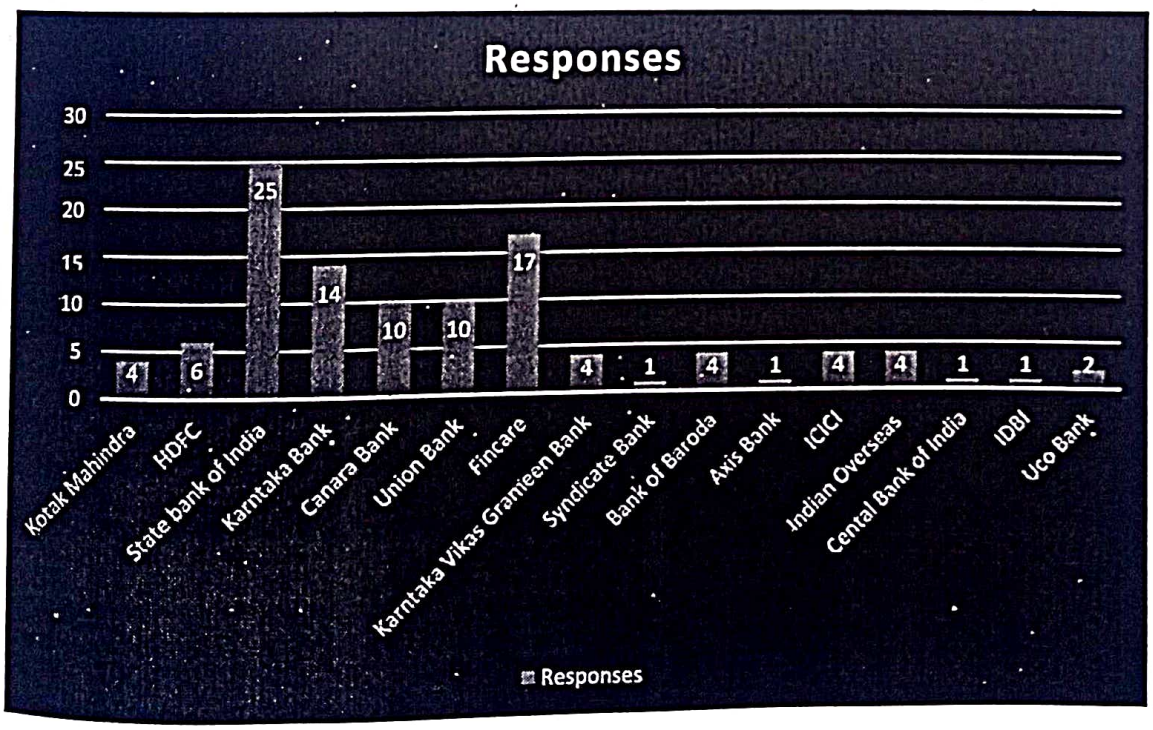
https://fincarebank.com/

Annexure

Data analysis and interpretation

1. Name of the bank

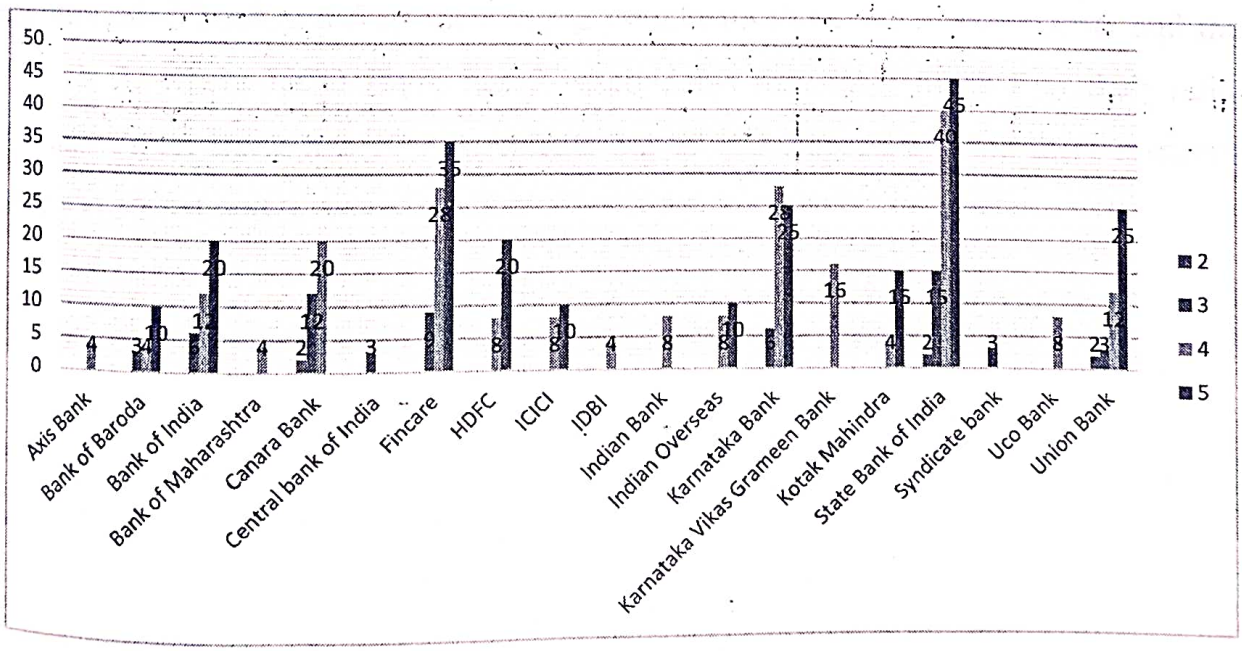
Banks	
Kotak Mahindra	4
HDFC	6
State Bank of India	25
Karnataka Vikas Grameen Bank	4
Fincare	17
Union Bank	10
Bank of India	9
ICICI	4
Canara Bank	10
Indian Overseas	4
Karnataka Bank	14
Bank of Baroda	4
Central Bank of India	1
UCO Bank	2
Bank of Maharashtra	1
Axis Bank	1
Indian Bank	2
Syndicate Bank	1
IDBI	1



Interpretation- This graph shows out of 120 respondents, 4 respondents are from Kotak Mahindra bank customers, 6 respondents are from HDFC bank customers, 25 respondents are from state bank of India bank customers, 14respondentsarefromKarnatakabankcustomers,10respondentsarefromCanarabank customers,10respondentsarefromunionbankcustomers,17respondents are from Fincare bank customers,4 respondents are from Karnataka Vikas Grameen bank,1 respondent from syndicate bank,4 respondents are from bank of Baroda customers,1 respondent from axis bank,4 respondents are from ICICI bank customers,4 respondents are from Indian overseas bank customers,1respondent from central bank of india,1 respondent from IDBI bank customers,2respondents are from Uco bank customers.

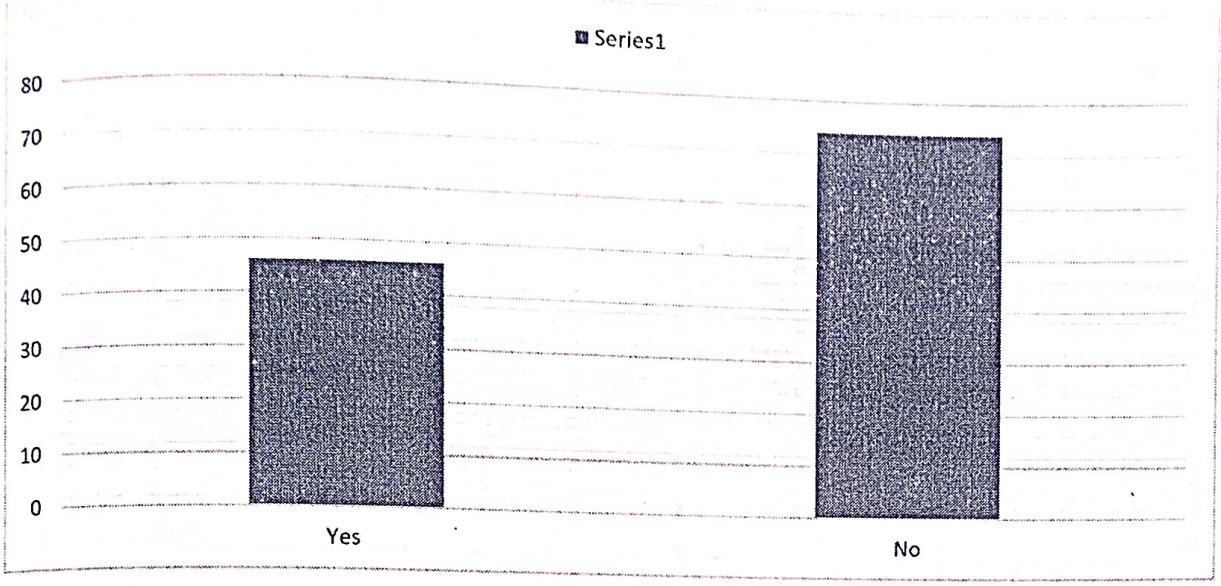
2. Considering your experience with your bank, how would you recommend your bank to others/friends?

Row Labels	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5	Grand Total
Axis Bank				1		1
Bank of Baroda			1	1	2	4
Bank of India			2	3	4	9
Bank of Maharashtra				1		1
Canara Bank		1	4	5		10
Central bank of India			1			1
Fincare			3	7	7	17
HDFC				2	4	6
ICICI				2	2	4
IDBI				1		1
Indian Bank				2		2
Indian Overseas				2	2	4
Karnataka Bank			2	7	5	14
Karnataka Vikas Grameen Bank				4		4
Kotak Mahindra				1	3	4
State Bank of India		1	5	10	9	25
Syndicate bank			1			1
Uco				1		1
Uco bank				1		1
Union Bank		1	1	3	5	10
(blank)						
Grand Total		3	20	54	43	120



Interpretation- This graph shows that out of 120 respondents the customers experience with their respective bank and overall recommendation where 1 respondent has recommended 4 rating for Axis Bank to their friends and colleague, 4 respondents has recommended 3,4 and 5 ratings for Bank of Baroda, where 9 respondents has recommended 3,4 and 5 rating for Bank of India, where 1 respondents has given 4 rating for Bank of Maharashtra, there are 10 respondents in Canara Bank and they have recommended 2,3 and 4 ratings for their bank, where 1 respondents from Central Bank of India and the rating was 3, there are 17 respondents from Fincare Small Finance Bank and most of them has recommended 3,4 and 5 ratings, where HDFC has 6 respondents and their respective ratings are 4 and 5, where 4 respondents of ICICI Bank has recommended 4 and 5 rating for their bank, IDBI Bank has 1 respondent and there rating is 4, where Indian Bank has 2 respondents and the rating is given as 4, there are 4 respondents in Indian Overseas and the rating is 4 and 5, Karnataka Bank has 14 respondents and most of them has recommended 3,4 and 5 as their ratings, Karnataka Vikas Grameen Bank has 4 respondents and their respective ratings is 4, where Kotak Mahindra Bank has 4 respondents where 4 and 5 ratings has been given by the respondents, State Bank of India has 25 respondents and most of them has recommended 2,3,4 and 5 as their rating, Syndicate Bank has 1 respondents and their rating is 3, where UCO Bank has 2 respondents they have rated 4 as their rating, whereas Union Bank has 10 respondents out of 120 respondents and there respective ratings are 2,3,4 and 5.

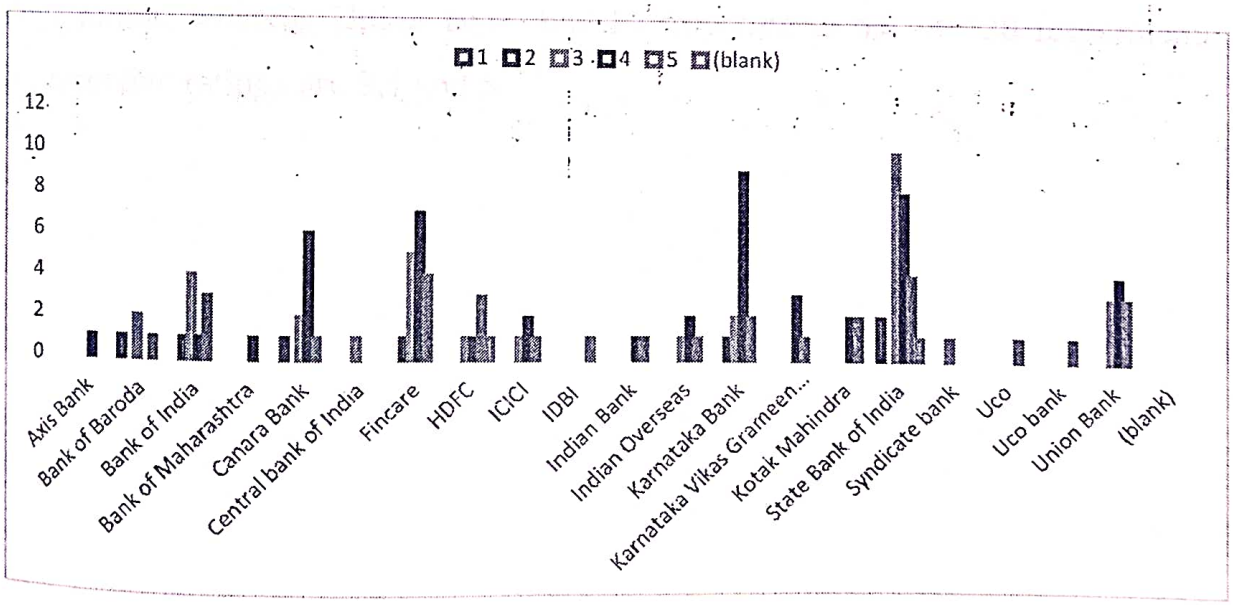
3. Do you have a Fincare 101 digital savings account?



Interpretation- This graph shows out of 120 respondents, 46 respondents are having 101 digital savings account, 74 respondents are not having 101 digital accounts.

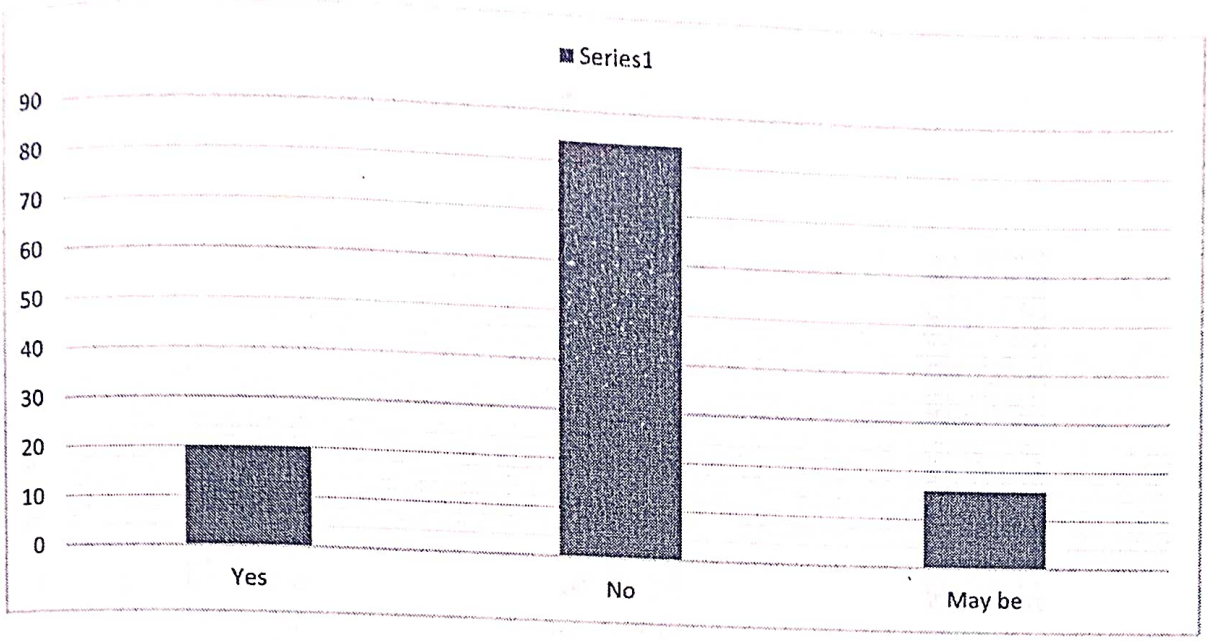
4. Overall, how would you rate your experience with us?

Count of Name of the Bank	Column Labels						
Row Labels	Rating 1	Rating 2	Rating 3	4	5	(blank)	Grand Total
Axis Bank				1			1
Bank of Baroda	1		2		1		4
Bank of India		1	4	1	3		9
Bank of Maharashtra				1			1
Canara Bank	1		2	6	1		10
Central bank of India			1				1
Fincare		1	5	7	4		17
HDFC			1	1	3	1	6
ICICI			1	2	1		4
IDBI					1		1
Indian Bank				1	1		2
Indian Overseas			1	2	1		4
Karnataka Bank		1	2	9	2		14
Karnataka Vikas Grameen Bank				3	1		4
Kotak Mahindra				2	2		4
State Bank of India	2		10	8	4	1	25
Syndicate bank			1				1
Uco					1		1
Uco bank					1		1
Union Bank			3	4	3		10
(blank)							
Grand Total	**4**	**3**	**33**	**48**	**30**	**2**	**120**



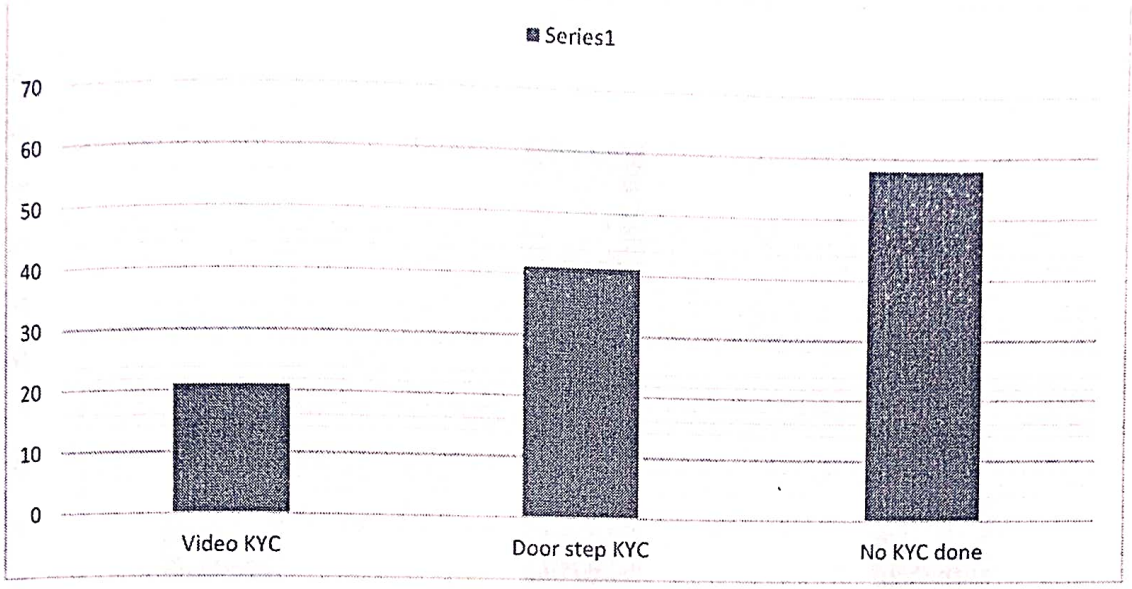
Interpretation – This graph shows that out of 120 respondents where 1 respondent has given 4 rating for Axis Bank according to their experience, 4 respondents has given 1,3 and 5 ratings for Bank of Baroda, where 9 respondents has given 2,3,4 and 5 rating for Bank of India, where 1 respondents has given 4 rating for Bank of Maharashtra, there are 10 respondents in Canara Bank and they have given 1,3,4 and 5 ratings for their bank, where 1 respondents from Central Bank of India and the rating was 3, there are 17 respondents from Fincare Small Finance Bank and most of them has recommended 2,3,4 and 5 ratings, where HDFC has 5 respondents and their respective ratings are 3,4 and 5, where 4 respondents of ICICI Bank has given 3,4 and 5 rating for their bank, IDBI Bank has 1 respondent and there rating is 5, where Indian Bank has 2 respondents and the rating is given as 4 and 5, there are 4 respondents in Indian Overseas and the rating is 3,4 and 5, Karnataka Bank has 14 respondents and most of them has given 2,3,4 and 5 as their ratings, Karnataka Vikas Grameen Bank has 4 respondents and their respective ratings is 4 and 5, where Kotak Mahindra Bank has 4 respondents where 4 and 5 ratings has been given by the respondents, State Bank of India has 24 respondents and most of them has given 1,3,4 and 5 as their rating, Syndicate Bank has 1 respondents and their rating is 3, where UCO Bank has 2 respondents they have rated 5 as their rating, whereas Union Bank has 10 respondents out of 120 respondents and their respective ratings are 3,4 and 5.

5. Did you face any difficulties, while creating bank accounts?



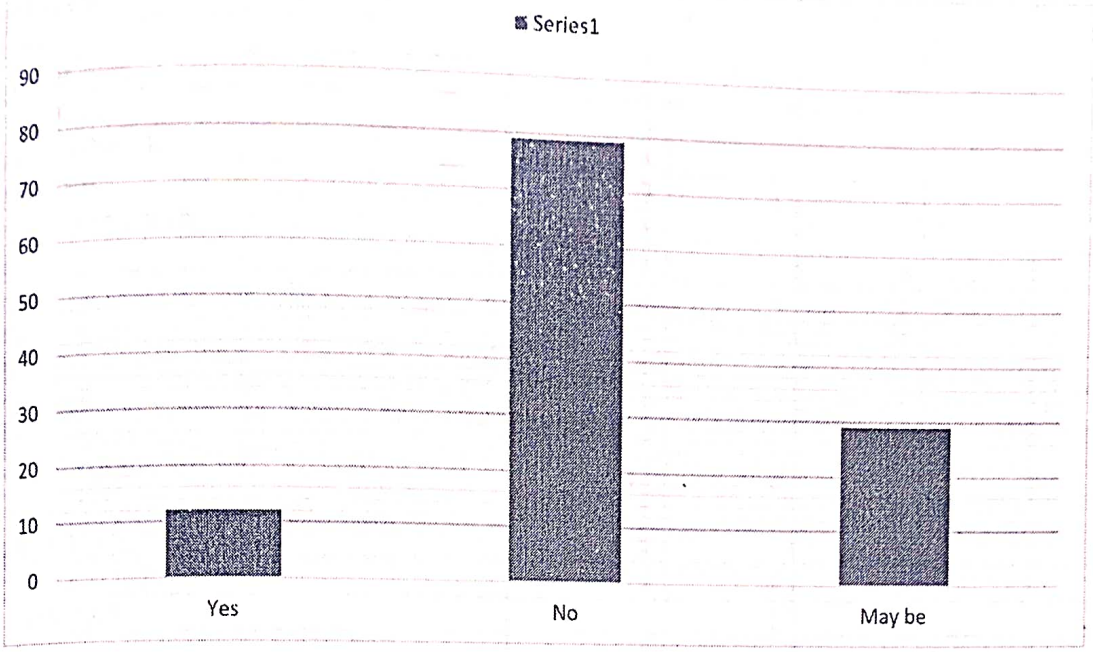
Interpretation-This graph shows out of 120 respondents, 20 customers are facing difficulties, while creating bank accounts, 84 customers are are not facing any difficulties, while creating bank accounts and 16 customers shave chosen maybe that they are facing any difficulties, while creating bank accounts.

6. How did you complete your KYC?



Interpretation- This graph shows out of 120 respondents, 21 customers are completed their KYC through video, 41 customers have done door step KYC, and 58 customers have not completed their KYC.

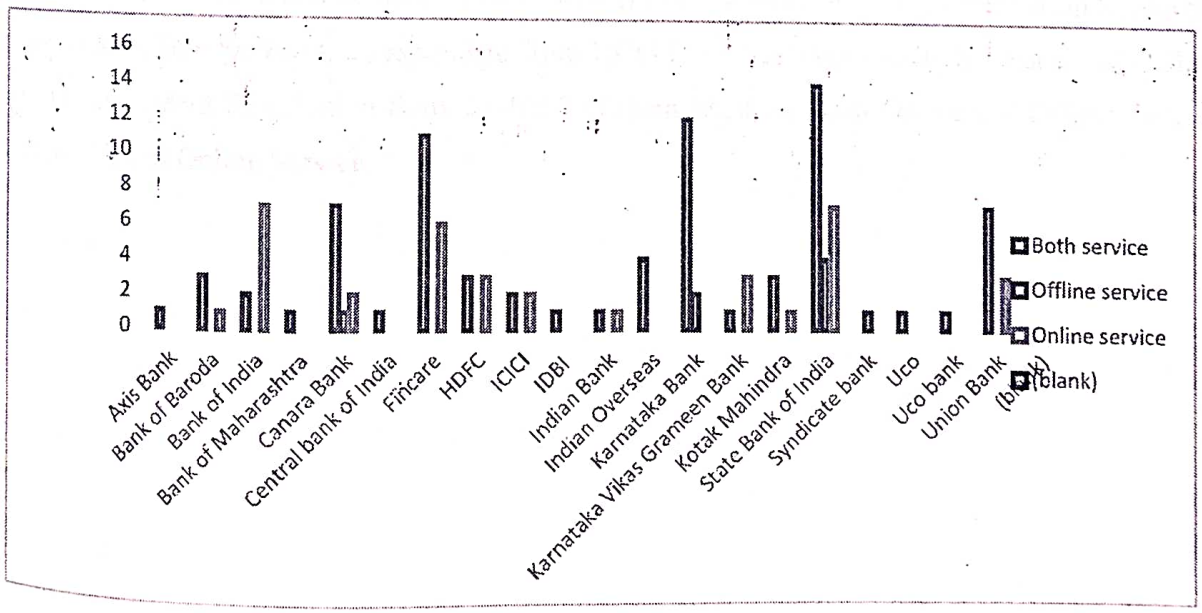
7. Did you face any difficulties, in completing KYC via Video KYC?



Interpretation-This graph shows out of 120 respondents, 12 customers are facing difficulties while completing video KYC, 79 customers are not facing difficulties while completing KYC, and 29 customers have chosen maybe that they are facing difficulties, while creating video KYC.

8. What type of bank services would you like the most?

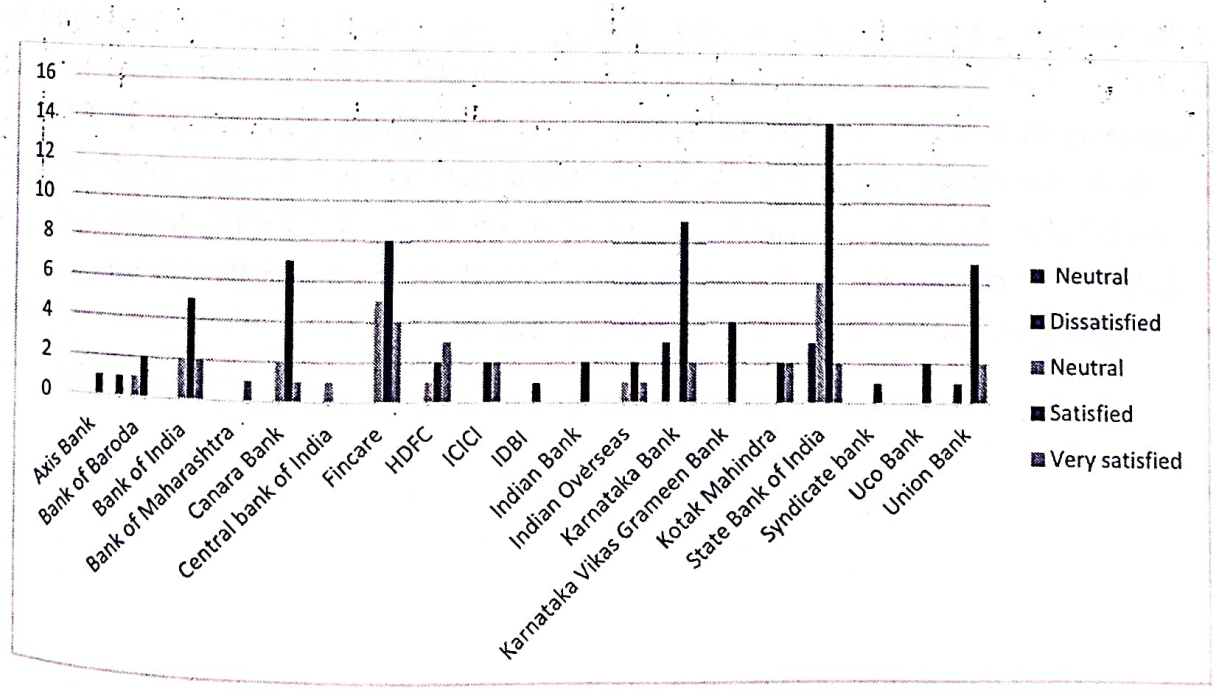
Row Labels	Both service	Offline service	Online service	(blank)	Grand Total
Axis Bank	1				1
Bank of Baroda	3		1		4
Bank of India	2		7		9
Bank of Maharashtra	1				1
Canara Bank	7	1	2		10
Central bank of India	1				1
Fincare	11		6		17
HDFC	3		3		6
ICICI	2		2		4
IDBI	1				1
Indian Bank	1		1		2
Indian Overseas	4				4
Karnataka Bank	12	2			14
Karnataka Vikas Grameen Bank	1		3		4
Kotak Mahindra	3		1		4
State Bank of India	14	4	7		25
Syndicate bank		1			1
Uco	1				1
Uco bank	1				1
Union Bank	7		3		10
(blank)					
Grand Total	**76**	**8**	**36**		**120**



Interpretation: In this graph out of 120 respondents,1 respondent from Axis Bank has liked the Both Online and Offline Service, 4 respondent from Bank of Baroda in that 3 of them liked the Both Online and Offline Service and 1 of them liked Online Service, 9 respondent from Bank Of India in that 2 of them liked both Online and Offline Service and 7 Respondents are liked Online Service, 1 respondent from Bank of Maharashtra has liked the Both Online and Offline Service,10 respondent from Canara Bank in that 7 of them liked the Both Online and Offline Service and 1 of them Offline and 2 of them Online Services,1 respondent from Central Bank of India has liked the Both Online and Offline Service, 17 respondent from Fin care Bank in that 11 of them liked the Both Online and Offline Service and 6 of them liked Online Service, 6 respondent from HDFC Bank in that 3 of them liked the Both Online and Offline Service and 3 of them liked Online Service, 4 respondent from ICICI Bank in that 2 of them liked the Both Online and Offline Service and 2 of them liked Online Service, 1 respondent from IDBI Bank has liked the Both Online and Offline Service, 2 respondent from Indian Bank in that 1 of them liked the Both Online and Offline Service and 1 of them liked Online Service,4 respondent from Indian Overseas Bank has liked the Both Online and Offline Service, 14 respondent from Karnataka Bank in that 12 of them liked the Both Online and Offline Service and 2 of them liked Offline Service, 4 respondent from Karnataka Vikas Grameen Bank in that 1 of them liked the Both Online and Offline Service and 3 of them liked Online Service, 4 respondent from Kotak Mahindra Bank in that 3 of them liked the Both Online and Offline Service and 1 of them liked Online Service,25 respondent from State Bank of India in that 14 of them liked the Both Online and Offline Service and 4 of them liked offline Service and 7 of them online services, 1 respondent from Syndicate Bank has liked offline Services, 2 respondent from UCO Bank has liked the Both Online and Offline Service, 10 respondent from Union Bank in that 7 of them liked the Both Online and Offline Service and 3 of them liked Online Service.

9. How would you rate the following services at your Bank? [Customer service]

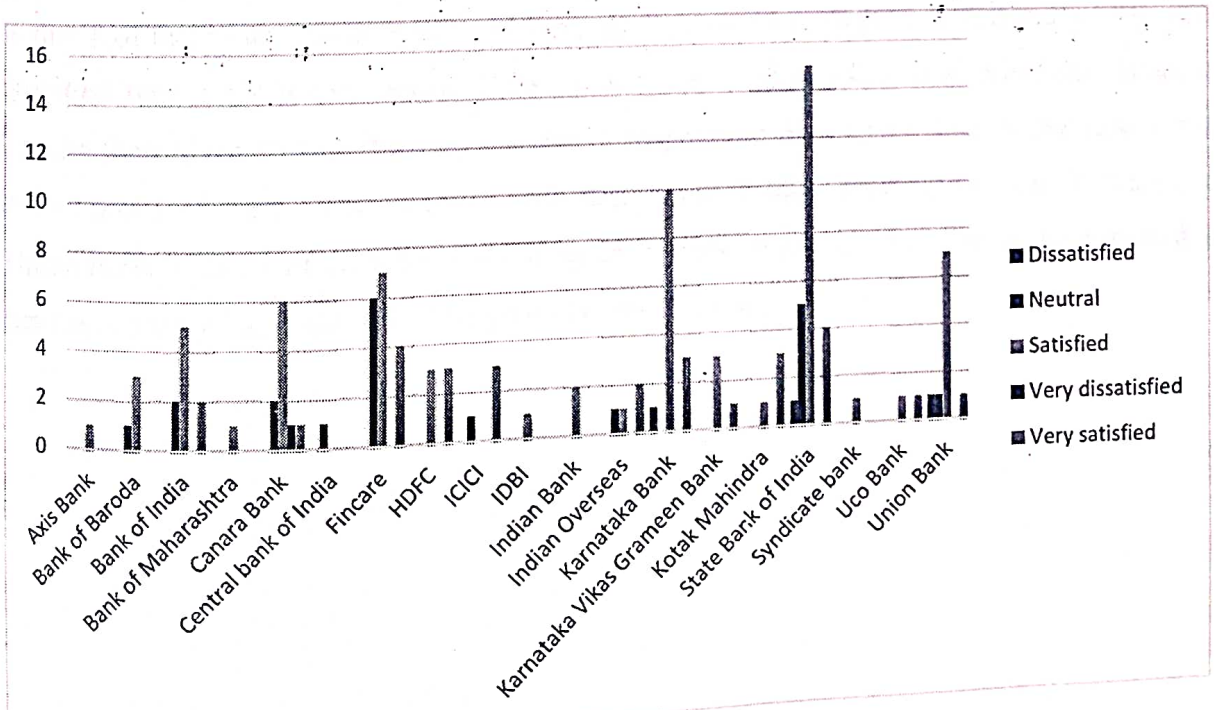
Row Labels	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied	(blank)	Grand Total
Axis Bank				1			1
Bank of Baroda	1		1	2			4
Bank of India			2	5	2		9
Bank of Maharashtra					1		1
Canara Bank			2	7	1		10
Central bank of India			1				1
Fincare			5	8	4		17
HDFC			1	2	3		6
ICICI				2	2		4
IDBI				1			1
Indian Bank				2			2
Indian Overseas			1	2	1		4
Karnataka Bank		3		9	2		14
Karnataka Vikas Grameen Bank				4			4
Kotak Mahindra				2	2		4
State Bank of India		3	6	14	2		25
Syndicate bank				1			1
Uco				1			1
Uco bank				1			1
Union Bank		1		7	2		10
(blank)							
Grand Total	**1**	**7**	**19**	**71**	**22**		**120**



Interpretation – This graph shows out of 120 respondents 1 respondent from Axis Bank has satisfied with the customer service, there are 4 respondents from Bank of Baroda has replied 1 is very dissatisfied 1 is neutral and 2 of them are satisfied with the customer service, where 9 respondents from Bank of India has replied 2 respondents has given neutral 5 respondents has satisfied and 2 of them are very satisfied, where 1 respondent from Bank of Maharashtra were he replied he is very satisfied with the customer service, there are 10 respondents in Canara Bank were 2 replied neutral 7 are satisfied and 1 is very satisfied with the customer service, where 1 respondent from Central Bank of India where he replied neutral, there are 17 respondents from Fincare small Finance Bank were 5 of them were replied neutral and 8 of them are satisfied and 1 is very satisfied with Loan service, there ae 6 respondents from HDFC Bank 1 of them has replied neutral 2 of them are satisfied and 3 of them are very satisfied with the customer service, where there are 4 respondents from ICICI Bank 2 of them are satisfied and another 2 of them are very satisfied, where 1 respondent from IDBI is satisfied with the customer service, there are 2 respondents from Indian Bank 2 of them are satisfied with customer service, there are 4 respondents from Indian Overseas where 1 of them has replied neutral 2 of them are satisfied 1 of them is very satisfied with the customer service, there are 14 respondents from Karnataka Bank were 3 of them are dissatisfied 9 of them are satisfied and 2 of them are very satisfied with their customer service, where there are 4 respondents from Karnataka Vikas Grameen Bank were 4 of them are satisfied with the customer service, there are 4 respondents from Kotak Mahindra Bank 2 of them are satisfied and another 2 of them are very satisfied with their customer service, where there are 25 respondents are from State Bank of India were 3 of them have replied dissatisfied 6 of them has replied neutral 14 of them are satisfied 2 of the are very satisfied with the customer service, where 1 respondent from Syndicate Bank replied that the respondent is satisfied with the customer service, there are 2 respondent from UCO Bank has replied 2 of them are satisfied with the customer service, there are 10 respondents from Union Bank were 1 respondent replied that the respondent is dissatisfied, 7 of them are satisfied were 2 of them are very satisfied with the customer service.

10. How would you rate the following services at your Bank? [Online banking service]

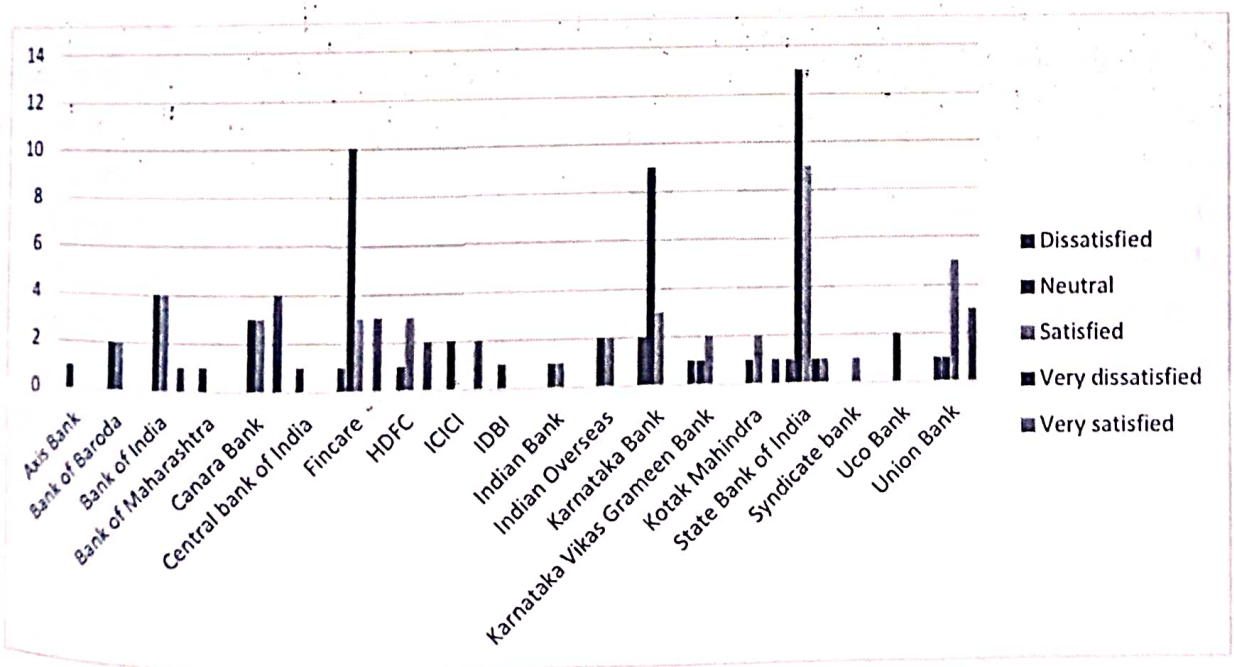
Row Labels	Dissatisfied	Neutral	Satisfied	Very dissatisfied	Very satisfied	Grand Total
Axis Bank			1			1
Bank of Baroda		1	3			4
Bank of India		2	5		2	9
Bank of Maharashtra			1			1
Canara Bank		2	6	1	1	10
Central bank of India		1				1
Fincare		6	7		4	17
HDFC			3		3	6
ICICI		1			3	4
IDBI			1			1
Indian Bank			2			2
Indian Overseas		1	1		2	4
Karnataka Bank	1		10		3	14
Karnataka Vikas Grameen Bank			3		1	4
Kotak Mahindra			1		3	4
State Bank of India	1	5	15		4	25
Syndicate bank			1			1
Uco Bank			1		1	2
Union Bank	1	1	7		1	10
Grand Total	**3**	**20**	**68**	**1**	**28**	**120**



Interpretation: In this graph out of 120 respondents,1 respondent from Axis Bank has satisfied with their given Online Banking Service, 4 respondent from Bank of Baroda in that 1 of them has Neutral and 3 of them are satisfied with their given Online Banking Service, 9 respondent from Bank of India in that 2 of them are Neutral, 5 of them are satisfied and 2 of them are Very Satisfied with their given Online Banking Service, 1 respondent from Bank of Maharashtra has satisfied with their given Online Banking Service, 10 respondent from Canara Bank in that 2 of them are Neutral, 6 of them are satisfied,1 of them are Very Dis-Satisfied and 1 of them has very Satisfied with their given Online Banking Service, 1 respondent from Central Bank of India has Neutral with their given Online Banking Service, 17 respondent from Fin care Bank in that 6 of them are Neutral, 7 of them are satisfied and 4 of them are Very Satisfied with their given Online Banking Service, 6 respondent from HDFC Bank in that 3 of them are satisfied and 3 of them are Very Satisfied with their given Online Banking Service, 4 respondent from ICICI Bank in that 1 of them has Neutral, 3 of them are very satisfied with their given Online Banking Service, 1 respondent from IDBI Bank has satisfied with their given Online Banking Service, 2 respondent from Indian Bank are satisfied with their given Online Banking Service, 4 respondent from Indian Overseas Bank in that 1 of them has Neutral and 1 of them has satisfied and 2 of them very Satisfied with their given Online Banking Service, 14 respondent from Karnataka Bank in that 1 of them has Dis-satified,10 of them are satisfied and 3 of them Very-Satisfied with their given Online Banking Service, 4 respondent from Karnataka Vikas Grameen Bank in that 3 of them are satisfied and 1 of them are very satisfied with their given Online Banking Service, 4 respondent from Kotak Mahindra Bank in that 1 of them has satisfied and 3 of them are very satisfied with their given Online Banking Service, 25 respondent from State Bank of India in that 1 of them has Dis-satified,5 of them are Neutral,15 of them Satisfied and 4 of them are Very Satisfied with their given Online Banking Service, 1 respondent from Syndicate Bank has satisfied with their given Online Banking Service, 2 respondent from UCO Bank in that one of them has satisfied and 1 of them Very Satisfied with their given Online Banking Service, 10 respondent from Union Bank in that 1 of them has Dis-satified,1 of them has Neutral,7 of them are Satisfied and 1 of them has are Very Satisfied with their given Online Banking Service.

11. How would you rate the following services at your Bank? [Loan service]

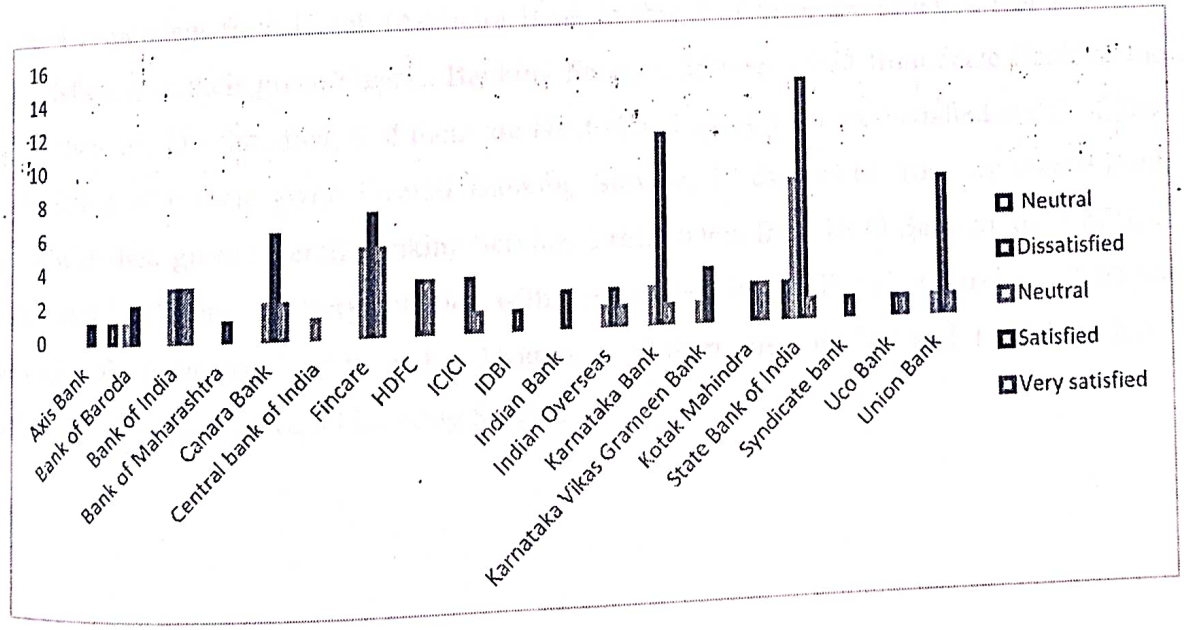
Row Labels	Dissatisfied	Neutral	Satisfied	Very dissatisfied	Very satisfied	Grand Total
Axis Bank		1				1
Bank of Baroda		2	2			4
Bank of India		4	4		1	9
Bank of Maharashtra		1				1
Canara Bank		3	3		4	10
Central bank of India		1				1
Fincare	1	10	3		3	17
HDFC		1	3		2	6
ICICI		2			2	4
IDBI		1				1
Indian Bank		1	1			2
Indian Overseas		2	2			4
Karnataka Bank	2	9	3			14
Karnataka Vikas Grameen Bank	1	1	2			4
Kotak Mahindra		1	2		1	4
State Bank of India	1	13	9	1	1	25
Syndicate bank			1			1
Uco Bank		2				2
Union Bank	1	1	5		3	10
Grand Total	**6**	**56**	**40**	**1**	**17**	**120**



Interpretation – This graph shows out of 120 respondents 1 respondent from Axis Bank has neutral with the Loan service, there are 4 respondents from Bank of Baroda has replied 2 are neutral and another 2 respondents are satisfied with the Loan service, where 9 respondents from Bank of India has replied 4 respondents has given neutral 4 respondents has satisfied and 1 of them are very satisfied, where 1 respondent from Bank of Maharashtra were he replied he is neutral with the Loan service, there are 10 respondents in Canara Bank were 3 replied neutral another 3 are satisfied and 4 is very satisfied with the Loan service, where 1 respondent from Central Bank of India where they replied neutral, there are 17 respondents from Fincare small Finance Bank were 10 of them were replied neutral and 3 of them are satisfied another 3 of them are very satisfied and 1 of them are dissatisfied with Loan service, there ae 6 respondents from HDFC Bank 1 of them has replied neutral 3 of them are satisfied and 2 of them are very satisfied with the Loan service, where there are 4 respondents from ICICI Bank 2 of them are neutral and another 2 of them are very satisfied, where 1 respondent from IDBI is neutral with the Loan service, there are 2 respondents from Indian Bank 1 of them are satisfied and 1 respondent replied neutral with Loan service, there are 4 respondents from Indian Overseas where 2 of them has replied neutral another 2 of them are satisfied with the Loan service, there are 14 respondents from Karnataka Bank were 2 of them are dissatisfied 3 of them are satisfied 9 of them are neutral and 2 respondents are dissatisfied with their Loan service, where there are 4 respondents from Karnataka Vikas Grameen Bank were 1 of them are dissatisfied 1 respondent is neutral 2 respondents are satisfied with the Loan service, there are 4 respondents from Kotak Mahindra Bank 2 of them are satisfied 1 of them are very satisfied and 1 respondent is neutral with their Loan service, where there are 25 respondents are from State Bank of India were 1 of them have replied dissatisfied 13 of them has replied neutral 9 of them are satisfied 1 of the are very dissatisfied with the Loan service, where 1 respondent from Syndicate Bank replied that the respondent is satisfied with the Loan service, there are 2 respondent from UCO Bank has replied 2 of them are neutral with the Loan service, there are 10 respondents from Union Bank were 1 respondent replied that the respondent is dissatisfied, 5 of them are satisfied were 3 of them are very satisfied and 1 respondent is neutral with the Loan service.

12.How would you rate the following services at your Bank? [Overall service]

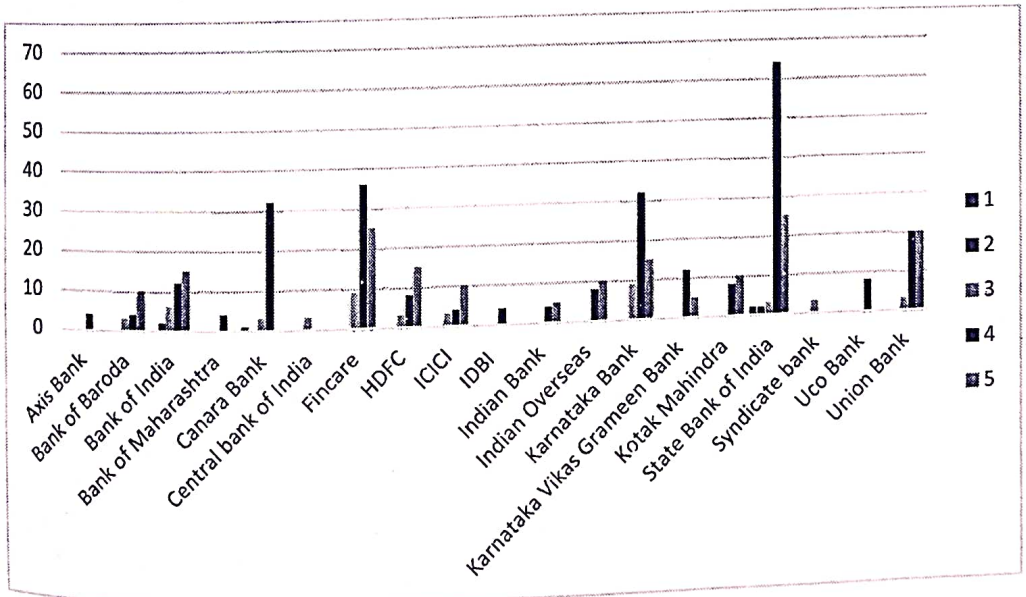
Row Labels	Very-Dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied	Grand Total
Axis Bank				1		1
Bank of Baroda	1		1	2		4
Bank of India			3	3	3	9
Bank of Maharashtra				1		1
Canara Bank			2	6	2	10
Central bank of India			1			1
Fincare			5	7	5	17
HDFC				3	3	6
ICICI				3	1	4
IDBI				1		1
Indian Bank				2		2
Indian Overseas			1	2	1	4
Karnataka Bank			2	11	1	14
Karnataka Vikas Grameen Bank			1	3		4
Kotak Mahindra				2	2	4
State Bank of India		2	8	14	1	25
Syndicate bank				1		1
Uco Bank				1	1	2
Union Bank			1	8	1	10
Grand Total	**1**	**2**	**25**	**71**	**21**	**120**



Interpretation: In this graph out of 120 respondents,1 respondent from Axis Bank has satisfied with their given Overall Banking Service, 4 respondent from Bank of Baroda in that 1 of them has Neutral, 1 of them has Very Dis-satisfied and 2 of them are satisfied with their given Overall Banking Service, 9 respondent from Bank of India in that 3 of them are Neutral, 3 of them are satisfied and 3 of them are Very satisfied with their given Overall Banking Service, 1 respondent from Bank of Maharashtra has satisfied with their given Overall Banking Service, 10 respondent from Canara Bank in that 2 of them are Neutral, 6 of them are satisfied and 2 of them are Very satisfied with their given Overall Banking Service, 1 respondent from Central Bank of India has Neutral with their given Overall Banking Service, 17 respondent from Fin care Bank in that 5 of them are Neutral, 7 of them are satisfied and 5 of them are Very satisfied with their given Overall Banking Service, 6 respondent from HDFC Bank in that 3 of them are satisfied and 3 of them are Very satisfied with their given Overall Banking Service, 4 respondent from ICICI Bank in that 3 of them are satisfied and 1 of them has Very satisfied with their given Overall Banking Service, 1 respondent from IDBI Bank has satisfied with their given Overall Banking Service, 2 respondent from Indian Bank has satisfied with their given Overall Banking Service, 4 respondent from India Overseas Bank in that 1 of them has Neutral, 2 of them are satisfied and 1 of them has Very satisfied with their given Overall Banking Service, 14 respondent from Karnataka Bank in that 2 of them are Neutral, 11 of them are satisfied and 1 of them has Very satisfied with their given Overall Banking Service, 4 respondent from Karnataka Vikas Grameen Bank in that 1 of them has Neutral, 3 of them are satisfied with their given Overall Banking Service, 4 respondent from Kotak Mahindra Bank in that 2 of them are satisfied and 2 of them are Very satisfied with their given Overall Banking Service, 25 respondent from State Bank of India in that 2 of them are Dis-Satisfied, 8 of them are Neutral and 14 of them are Satisfied and 1 of them has very Satisfied with their given Overall Banking Service, 1 respondent from Syndicate Bank has satisfied with their given Overall Banking Service, 2 respondent from UCO Bank in that 1 of them has satisfied and 1 of them has Very satisfied with their given Overall Banking Service, 10 respondent from Union Bank in that 1 of them has Neutral, 8 of them are satisfied and 1 of them has Very satisfied with their given Overall Banking Service.

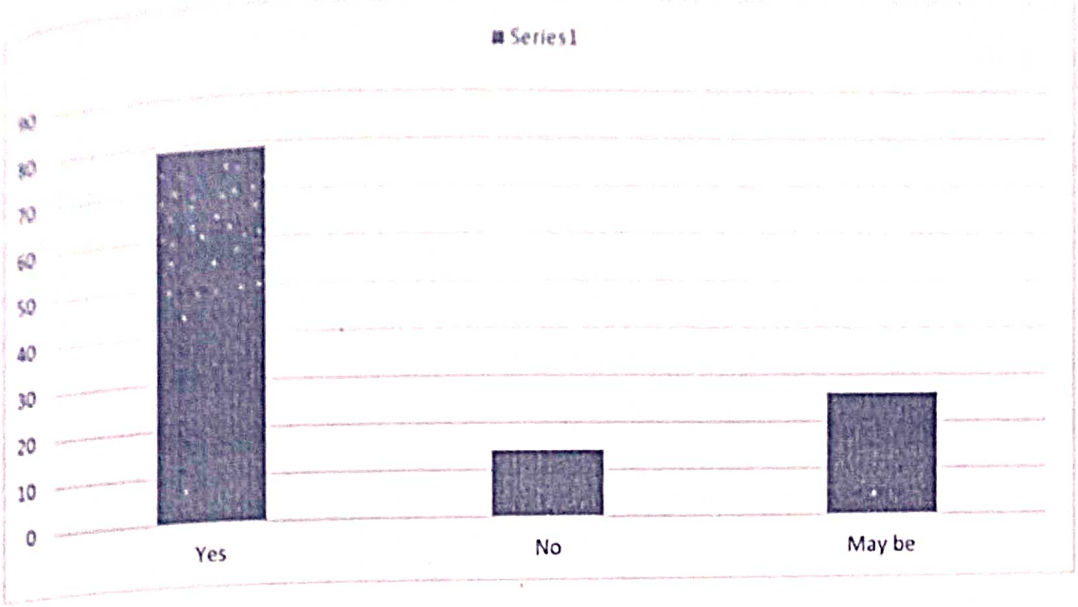
13. How satisfied are you with your bank?

Count of Name of the Bank	Column Labels						
Row Labels	1	2	3	4	5	(blank)	Grand Total
Axis Bank				1			1
Bank of Baroda			1	1	2		4
Bank of India		1	2	3	3		9
Bank of Maharashtra				1			1
Canara Bank	1		1	8			10
Central bank of India			1				1
Fincare			3	9	5		17
HDFC			1	2	3		6
ICICI			1	1	2		4
IDBI				1			1
Indian Bank				1	1		2
Indian Overseas				2	2		4
Karnataka Bank			3	8	3		14
Karnataka Vikas Grameen Bank				3	1		4
Kotak Mahindra				2	2		4
State Bank of India	2	1	1	16	5		25
Syndicate bank			1				1
Uco				1			1
Uco bank				1			1
Union Bank			1	5	4		10
(blank)							
Grand Total	3	2	16	66	33		120



Interpretation –This graph shows out of 120 respondents, 1 respondent from axis bank is given 4 ratings, there are 4 respondents from bank of Baroda has given 3,4 and 5 ratings, where 9 respondents from bank of India has replied 2,3,4 and 5 ratings, where 1 respondent of bank of Maharashtra has given 4 rating, there are 10 respondents from Canara bank the ratings are 1,3 and 4,where 1 respondent from central bank of India has replied 3 rating, there are 17 respondents from Fincare small finance bank where they have given 3,4 and 5 ratings are given , there are 6 respondents from HDFC bank the ratings are 3,4 and 5,where there are 4 respondents from ICICI bank 3,4 and 5 ratings are given,1 respondents from IDBI has given 4 rating,2 respondents from Indian bank and the ratings are 4 and 5,where there are 4 respondents from Indian overseas 4 and 5 ratings are given , there are 14 respondents in Karnataka bank most of them rated 3,4, and 5,there are 4 respondents from Karnataka Vikas Grameen bank 4 and 5 ratings are given , where there are 4 respondents from Kotak Mahindra 4 and 5 ratings are given, there are 25 respondents from State Bank of India most of them are given 1,2,3,4 and 4 ratings,1 respondent from syndicate bank has given 3 rating, there are 2 respondents from uco bank 3 and 4 ratings are given, there are 10 respondents from union bank 3,4 and 5 rating are given.

14. Would it be okay for you to follow up with you about your responses?



Interpretation-This graph shows out of 120 respondents, 79 customers are to be okay to follow up with their given responses, 13 customers are not ready to follow up with their given responses, and still 26 customers have chosen maybe that they are okay for to follow up with their given responses.

B.V.V. Sangha's

Basaveshwar Engineering College (Autonomous) Bagalkot

Department of Management Studies

MBA Programme

Date: 16-09-2021

From
Channabasav Hiremath
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkot-587103

To
The Head of the Department
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkote-587103

WEEKLY PROGRESS REPORT

Dear Madam,

Subject: Internship Progress Report of Week from 02-09-2021 to 16-09-2021

1. **Address & Contact Number of the Organization:**

   Name of the Organization: Fincare Small Finance Bank
   Address: Bangalore, Karnataka
   Contact No: 8127013143

   Name & Designation of the Guide: Akshay Kumar Sanghi
   Mobile No: 8127013143

2. **How many reports have you sent so far:** 0

3. **Brief write up of the progress of the Internship during the week:** In first week, we got a one-day training program, where they have given the introduction about Fincare bank and its products. Those products are proposed to rural as well as urban customers. As there are 2 types of accounts for different types of customers according to their income, one is 101 saving account and another one is general account. I have given solutions to their queries regarding issues in opening an account in Fincare.

Signature of the Student

Channabasav Hiremath

Signature of the External Guide with Seal

Fincare Small Finance Bank Ltd. Bangalore

Date: 30-09-2021

From
Channabasav Hiremath
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkot-587103

To
The Head of the Department
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkote-587103

WEEKLY PROGRESS REPORT

Dear Madam,

Subject: Internship Progress Report of Week from 17-09-2021 to 30-09-2021

1. **Address & Contact Number of the Organization:**

   Name of the Organization: Fincare Small Finance Bank
   Address: Bangalore, Karnataka
   Contact No: 9353800950

   Name & Designation of the Guide: Akshay Kumar Sanghi
   Mobile No: 8127013143

2. **How many reports have you sent so far:** 1

3. **Brief write up of the progress of the Internship during the week:** In this week, we did work on "Net promoter score" [NPS], which measures the customers experience, satisfaction and their loyalty towards their bank. On the basis of customer's feedback and NPS calculation, banks can improve their performance and customer service. By subtracting the percentage of detractors from the percentage of promoter's yield, we will get net promoter score. With the help of this, we can understand customer satisfaction levels and their probability of continuation with the bank.

Signature of the Student

Channabasav Hiremath

Signature of the External Guide with Seal

Fincare Small Finance Bank Ltd. Bangalore

Basaveshwar Engineering College (Autonomous) Bagalkot
Department of Management Studies
MBA Programme

Date: 14-10-2021

From
Channabasav Hiremath
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkot-587103

To
The Head of the Department
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkote-587103

WEEKLY PROGRESS REPORT

Dear Madam,

Subject: Internship Progress Report of Week from 01-10-2021 to 14-10-2021

1. **Address & Contact Number of the Organization:**

   Name of the Organization: Fincare Small Finance Bank
   Address: Bangalore, Karnataka
   Contact No: 8127013143

   Name & Designation of the Guide: Akshay Kumar Sanghi
   Mobile No: 8127013143

2. **How many reports have you sent so far:** 2

3. **Brief write up of the progress of the Internship during the week:** In this week, I have framed questionnaire and then, I collected feedback from the customers by using google forms.

Signature of the Student

Channabasav Hiremath

Signature of the External Guide with Seal

Fincare Small Finance Bank Ltd. Bangalore

B.V.V. Sangha's

Basaveshwar Engineering College (Autonomous) Bagalkot
Department of Management Studies
MBA Programme

Date: 21-10-2021

From
Channabasav Hiremath
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkot-587103

To
The Head of the Department
Department of Management Studies
Basaveshwar Engineering College (A)
Bagalkote-587103

WEEKLY PROGRESS REPORT

Dear Madam,

Subject: Internship Progress Report of Week from 14-10-2021 to 21-10-2021

1. **Address & Contact Number of the Organization:**

Name of the Organization: Fincare Small Finance Bank
Address: Bangalore, Karnataka
Contact No: 8127013143

Name & Designation of the Guide: Akshay Kumar Sanghi

Mobile No: 8127013143

2. **How many reports have you sent so far:** 3

3. **Brief write up of the progress of the Internship during the week:** In this week, on the bases of customer feedback, I have analyzed and interpret the data regarding net promoter score. From this data, I did some findings, and gave suggestions to the organization. At the end, I also gave conclusion for the project.

Signature of the Student

Channabasav Hiremath

Signature of the External Guide with Seal

Fincare Small Finance Bank Ltd. Bangalore

Project Thesis (UEE865P) on

Development and Performance Testing of SPV Powered Mobile Canteen with DC Loads

Submitted in partial fulfilment of requirements for the award of degree of

Bachelor of Engineering

Submitted by:

Naveenkumar	(2BA18EE031)
Neelaganga Goudar	(2BA18EE033)
Shruti Walikar	(2BA18EE048)
Vivek	(2BA19EE413)

Under the Guidance of

Dr. Basanagouda F. Ronad
Professor, EEED, BEC (A) Bagalkot

Submitted to

BVVS

Basaveshwar Engineering College (Autonomous)
[AICTE Recognized, TEQIP-I,II&III, Permanently Affiliated to VTU Belagavi, NBA & NAAC Accredited]
Bagalkot-587103, Karnataka state, India

Department of Electrical & Electronics Engineering
[Govt. Aided, Accredited by NBA 2003, 2006, 2018, Recognized R&D centre of VTU]

BVVS

Basaveshwar Engineering College (Autonomous)

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Certificate

This is to certify that the project entitled **"Development and Performance Testing of SPV Powered Mobile Canteen with DC Loads"** is a bonafide work of **Naveenkumar (2BA18EE031) Neelaganga Goudar (2BA18EE033), Shruti Walikar(2BA18EE048), Vivek (2BA19EE413).***The thesis satisfies partial requirements in respect of project work UEE865Pprescribed for VIII semester for the award of Bachelor of Engineering degree in Electrical and Electronics Engineering during the academic year 2021-22.*

Dr. Basanagouda Ronad	Dr. Suresh H Jangamshetti	Dr. S. S. Injaganeri
Project Guide	Head of the Department	Principal

Name of the Examiner	Signature
1.	
2.	
3.	

Basaveshwar Engineering College (Autonomous), Bagalkot
Department of Electrical and Electronics Engineering

Outcome Based Learning
(For internal audit of teaching-learning outcome)

Note: *Project is an important integral part of BE(E&EE) program. Project is outcome of 4 years of engineering program and is expected to test the learning skills of a student. It reflects quality of teaching-learning process in the department. Project work will remain as an epitome of your entire professional career.*

Sl.	Project attributes	Learning Sources	Learning Outcomes	Mapping	
				CO	PO
1.	Literature survey	• Discussion with the guide • Mini project (UEE665P) • Field Visits: ▪ Energy Park, BEC ▪ Solar Power Plant, BEC Rooftop. • Thesis: "Design and Development of DC-DC Converter employed for DC Distribution System in Domestic and Commercial Loads", 2020-21.	• Able to understand about the advantages of DC distribution system and SIMO DC-DC converter. • Able to analyze the compatibility of DC loads with DC distribution system and energy saving options. • Able to analyze the different SIMO DC-DC converter topologies.	01, 02	01, 02, 03, 05, 12
2.	Problem Formulation	• Power Electronics (UEE452C))C-DC Converter] • Thesis: "Design and Development of DC-DC Converter employed for DC Distribution System in Domestic and Commercial Loads" • Discussion with guide about the DC-DC converter	• Able to Identify and understand the problem associated with existing DC-DC Converter. • Able to understand the prototype model of DC-DC converter with DC loads and identified that real time experimentation is not carried out. • Able to identify the issues associated with grid independent loads in isolated areas.	01, 06	02, 06, 07, 08
3.	Project Objectives	• Thesis: "Design and Development of DC-DC Converter employed for DC Distribution System in Domestic and Commercial Loads" • Discussion with guide	• Able to propose the need for SIMO DC-DC converter for DC distribution system. • Able to employ the existing domestic loads operated at different voltage levels for the proposed SIMO model • Able to set clear and tuned objectives for the project.	02, 06	03, 07, 08, 12

4.	Methodology and Implementation	• Solar Photovoltaic System Design (UEE754E))esigning SPV System] • Power Electronics (UEE452C))C-DC Converter]	• Able to design and develop DC distribution system with solar panels, DC-DC converter and DC loads. • Able to design SIMO DC-DC converter integrated for DC distribution system.	02, 03, 06	03, 04, 05, 06
5.	Results and Discussions/ interference	• Project work phase 1 (UEE765P) • Power Electronics Laboratory (UEE456L))iscussion with guide])C voltage control using chopper]	• Able to carry experimentation and test performance of DC-DC converter with proposed DC loads. • Able draw inference about the compatibility of DC loads with DC distribution system. • Able to conclude the sustainable solution for small scale DC distribution system.	03, 05, 06	04, 06, 07
6.	Thesis/Report Writing	• Mini project (UEE665P) • Attend the webinar on "Etiquettes of writing technical thesis and paper"	• Able to present and document the project in a systematical manner. • Able to apply writing skills for thesis.	04, 05, 06	08, 09, 10
7.	Planning Budget	• Management and Entrepreneurship (UEE653H) lanning and Budgeting]	• Able to manage and plan the financial aspects while carrying the procurement of components for the project.	04, 06	11, 12
8.	Presentation	• Mini project (UEE665P) • Management and Entrepreneurship (UEE653H) resentation Skills]	• Able to prepare the presentation in professional manner • Able to defend our work with technical information	04, 06	09, 10, 12

Project Guide **Project Associates**

Course Outcomes (CO) of Project Phase-2

Students will able to:

1. Identify, formulate & analyze the engineering problems associated with electrical & electronics engineering and interdisciplinary research.
2. Design & implement proposed solutions for complex engineering problems to meet specified objectives
3. Make use of contemporary tools & resources to analyze / validate the design / solutions of engineering problems
4. Communicate effectively while working in collaboration to meet the project & financial management aspects and to present the work to technical audience.
5. Prepare quality technical report with detailed analysis and interpretation of results to yield valid conclusions
6. Demonstrate the social, ethical cultural & engineering professional responsibilities.

PROGRAM OUTCOMES (PO)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **.Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or process that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to asses societal, health, safety, legal and cultural issues and consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in social and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms for sustainable development.
9. **Individual and team work**: Function effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Acknowledgements

We would like to express our gratitude towards all the people who have contributed their precious time and efforts by helping us in completing the project.

We are profoundly grateful to our project guide **Dr. Basanagouda Ronad** for their guidance, encouragement, support and valuable advice.

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Words are not enough to express our gratitude to our family who apart from showering their blessing have been a constant support and encouragement. Also, we would like to convey our thanks to all our friends who have directly or indirectly involved in our project.

Project Associates

Dedicated to

My parents

Teachers and

Friends

Abstract

As many as 400 million Indians work in the informal sector and 5% of this group is engaged in street vending works. Street vendors can be called small capitalist of the poor, are largely independent and entrepreneurial. Major Street vendors are fruit juice stalls, outdoor canteens, tea stalls, hot chip centres etc. They are very important category of informal sector with specific issues and challenges associated with the supply of electricity. In any metro city 2.5 % of the population consist of street vendors, out of which 50% are outdoor and outskirts vendors, isolated from electrical power connections. Further, street vendors are in ample numbers in semi-urban and rural areas too. They find it difficult to get electricity, which makes their regular commercial activities a burden.

This thesis presents the development and performance testing of SPV powered mobile canteen with different DC loads. Shelter type solar based cart is developed for the mobile canteen with DC distribution system. Electrical supply to the loads and to the cart is given by SPV modules. There are many DC appliances which can be used by the street vendors in their mobile canteen which basically uses the DC Power. These loads can be directly operated through DC voltages in DC distribution system. In this regard the loads are listed and the respective DC ratings are assessed. Further desired voltage levels for the loads are selected. The SIMO DC-DC converter is adopted to get different voltage levels. 12 volts input is given to the DC-DC converter by SPV panels. DC-DC converter will result in different voltages of 12V, 24V, 36V & 48V. DC-DC converter units consists of three DC-DC boost converters of same ratings which can be operated up to 72 volts & 60 amperes. Different combination of loads is connected to the respective voltage terminals of DC-DC converter. Operating voltage and operating current of DC loads are noted which shows performance of DC-DC Converter unit and also satisfy the power supply to loads from solar panels.

Demonstration of the shelter type SPV powered mobile canteen with DC distribution is successfully carried out. Thus, it resolves the electricity issue for the street vendors for the mobile canteen who are isolated from the grid power connection. It also proves that conventional AC system can be replaced by the DC system that has advantages in terms of cost, performance reliability, stability and efficiency. Therefore, the proposed SPV mobile canteen results in sustainable solution for small scale DC distribution systems for domestic and commercial applications and the proposed idea of SPV shelter powered DC energy systems can be extended for the domestic household applications and stand telecom towers etc.

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CHAPTER – 1

OVERVIEW

This chapter presents the insight on the present DC distribution system and DC-DC Converter. It gives the motivational factors for taking up the project. Objectives and field visit, literature survey carried out for the project are described.

1.1. Introduction

As many as 400 million Indians work in the informal sector and 5% of this group is engaged in street vending works. Street vendors can be called small capitalist of the poor, are largely independent and entrepreneurial. Major street vendors are fruit juice stalls, outdoor canteens, tea stalls, hot chip centres etc. They are very important category of informal sector with specific issues and challenges associated with the supply of electricity. In any metro city 2.5 % of the population consist of street vendors, out of which 50% are outdoor and outskirts vendors, isolated from electrical power connections. Further, street vendors are in ample numbers in semi-urban and rural areas too. They find it difficult to get electricity, which makes their regular commercial activities a burden. These vendors are located mostly in street, lane, side walk, foot path, pavement, public park or any other public places or private areas, from a temporary builtup structure or by moving from place to place and includes hawker, peddler, squatter and many other ways employed by local or regions specific.SPV shelter powered DC energy systems can be extended for mobile vendor's appliances etc…

Renewable Energy and DC Micro grids have very close operational association. Advancement and wide employability of renewable energy needs modification in the loads as well. In this regard the conventional AC loads are to be switched to DC. Hence, supporting DC distribution systems. DC distribution systems have major advantages over AC microgrids, including higher efficiency, reliability and stability. SPV panels directly produce DC power and hence they can readily be connected to DC loads without or with little conversion requirements.

DC-DC converters are widely used in today's electric devices as they are indispensable in the use of domestic and commercialappliances.However they are designed for the use in low voltage range. The DC-DC converters convert one level of DC voltage to another level. The operating voltage of different electronic devices such as IC's, MOSFET can vary over a wide

range, making it necessary to provide a voltage for each device. Designing DC-DC converters of high voltage level is a real challenge for engineering world.

Fig .1.1 .Solar-Wind based food cart

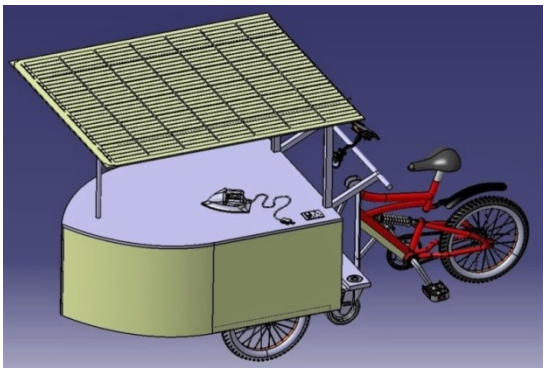

Fig .1.2. Solar based laundry shop

Fig.1.3. Solar based carts

Fig .1.4.Solar based Canteen

1.2. Motivation

The main motivation behind this project is, in present day the use of renewable energy sources and DC micro grids have prominence over conventional AC supply. Accessing AC power for isolated loads from grid is difficult. Existing Domestic and Commercial DC Loads operated at different voltage levels [12 V, 24 V….48 V].For their fulfillment either they have to go for tapping the AC distribution lines which is highly dangerous. So, to overcome this issue SPV based Single Input Multiple Output DC-DC Converter for DC distribution system in mobile canteen is taken up. However, mobile canteen/outdoor commercial stalls completely powered independent of grid connections has not been proposed.

1.3. Literature Survey

1. **Ambika et. al. "Design and Development of DC-DC Converter Employed for DC Distribution System in Domestic and Commercial Loads", Electrical and Electronics Department Basaveshwar Engineering College, Bagalkot, 2021.**

   This project presents design, simulation and development of Single Input Multiple Output (SIMO) DC-DC converter for DC distribution system employed for domestic and commercial loads. The converter behavior verified using Simulation and Experimental Prototype. Proteus software is used for simulation. Simulation model is built for DC-DC converter with 24 V input and resulting 12 V, 24 V, 32 V and 48 V DC output voltages. Regularly used domestic loads which basically operate on DC voltages are considered for the design and thus these loads are proposed to be operated in a DC distribution system. For the selected loads current and voltage assessment during their full load performance is conducted. Based on these values, converter parameters for buck and boost operation are evaluated. Further, the circuit is successfully tested for its operation in Proteus software. Real time implementation of the proposed DC-DC converter for 12V, 24V, 32V and 48V output voltages are carried out. Performance of the converter is tested with different loads and combinations. proposed concept decreases the dependency on conventional energy sources, while satisfying the electricity requirement for remotely located domestic DC load requirements.

2. **Aseef Ali, Anupkumar M, Ibrahimkhalil M Anasari, Manjula "Design, Development and Testing of Shelter Type SPV based Fruit Juicer for Outdoor Juice Vendors" Electrical and Electronics Department Basaveshwar Engineering College, Bagalkot 2019.**

   This thesis presents a SPV based Fruit Juicer, in this DC extractor is designed and Constructed and tested the effective performance of the juicer with SPV. Here extraction is achieved by replacing conventional AC motor by DC motor (DC motor rating: 24V, 13.4A, 250W, 2750rpm). Battery is used to supply the power during non-sunshine hours. The proposed model is only for single output without any converter.

   Experiment conducted on juicer with different fruits like Apple, Sapota, Watermelon, orange, banana and muskmelon were employed for testing the performance of the developed model and performance results are analyzed. The performance tests are conducted successfully in BEC campus. Time taken for juice preparation is less under high solar radiations. With lower radiations of range 500W/m^2, slightly higher time is consumed. It reduces certain tedious work in this sector and hence encourages many people to take up juicing as their profession.

3. **Muhammad Kamran, Muhammad Bilal, Muhammad Mudassar "DC Home Appliances for DC Distribution System" Mehran University Research Journal of Engineering and Technology, Volume 36, No. 4, October 2017.**

   This paper strengthens the idea of DC distribution system for DC home appliances. This paper investigates the energy savings by adopting DC distribution system instead of conventionally dominant AC distribution system. A DC microgrid of 308V is chosen as a distribution line voltage. home appliances are modified to operate on 48V from DC distribution line. Instead of using universal and induction motors in rotary appliances, BLDC (Brushless DC) that are highly efficient with minimum electro-mechanical and commutation losses. Proposed DC system reduces the power conversion stages, hence diminishes the associated power losses and standby losses that boost the overall efficiency. so, in view of all this a conventional AC system can be replaced by a DC system that has many advantages by cost as well as by performance.

   Home appliances are modified by removing voltage transformation, rectification and replacing Single phase induction motor with most efficient BLDC motors. In order to estimate the energy savings by adopting a DC distribution system, power ratings of different home internally DC appliances taking AC as input are collected. AC-DC power conversion losses are calculated. Then a load profile for a family of 3 members for month is calculated and it is observed that 65.4kWh/month/home energy can be saved if the internally DC appliances are operated directly on DC. The replacement of AC motor with BLDC motor increases the overall efficiency of the system by 24%.

4. **Dr. Prakash. G. Burade and Nirasha.D.Ramteke "Design of Single Input Multiple Output DC-DC Converter" International Journal of Engineering Research & Technology (IJERT) ISSN:2278-0181 IC-QUEST-2016 Conference Proceedings.**

   This paper presents high efficiency single input multiple output dc-dc converter with coupled inductor. The converter proposed can boost the voltage of a low voltage input power source to controllable high voltage dc and middle voltage output terminals. The proposed converter uses only one power switch and main objectives of high efficiency power conversion, and different outputs, high step-up ratio. The techniques of soft-switching and voltage clamping are used to reduce the switching loss and conduction loss of dc-dc converter.

   The system configuration of the proposed high efficiency Single Input Multiple Output converter topology to generate different voltage levels from single input power source.

This converter contains five parts including a low voltage side circuit (LVSC), a clamped circuit, a middle voltage circuit, an auxiliary circuit and high voltage side circuit (HVSC).

The voltage can be substantially increased by using a coupled inductor. The stray energy can be recycled by a clamped capacitor. The propose single input multiple output converter is suitable for the appliances required one common ground, which is preferred in most applications.

5. **Chinnu V V, Daisykutty Abraham, Ninu Joy "An Integrated Single Input Multiple-Output DC-DC Converter with simultaneous Buck and Boost Outputs" International Journal of Advanced Research Electrical, Electronic and Instrumentation Engineering Vol. 3, Special**

   This paper presents Multi port DC-DC converter topologies can be used to generate multiple DC outputs from a single DC input source. The voltage gains can be step-up or step-down type. This paper proposes a multi-port DC-DC converter topology which generates multiple outputs, which can step-up as well as step-down, from a single DC input. Multiple dc port converter used in application such that hybrid electric vehicles, dc-based nano grids, LED drivers and stand by power supplies. The proposed system uses N+1 switch for N outputs.The proposed single input multiple output converters have been simulated using theMATLAB/SIMULINK (R2010a). The simulated results justify the behavior of the converter. Theresult shows that proposed converter can generate four outputs (two step-up as well as step-down outputs) from a single DC input which produces a step-up output of 30V and 15V and step-down output of 8V and 4V. The behavior of the proposed converter has been verified using a laboratory prototype, which produces a step-up voltage of 30V and step-down voltage of 6V from single 15V DC input.

6. **Bukya Rajesh "Design of Modified Single Input Multiple Output DC-DC Converter" International Journal of Computer Science and Mobile Computing, Vol.3, Issue.10, October 2014.**

   This paper presents modified single input multiple output dc-dc converter can be used to give multiple outputs. It has three outputs. That is low voltage power source is converted into high voltage DC bus and middle voltage output terminals. This dc-dc converter utilizes the properties of voltage clamping and soft switching based on a coupled inductor. In this paper design of single input multiple output dc-dc converter along with modes of operation has been presented using

MATLAB/SIMULINK. Simulation results thus obtained show that, the objective of high efficiency, high step-up ratio and various levels of output voltage. The proposed SIMO converter is suitable for the application required one common ground, which is preferred in most applications. The voltage gain can be substantially increased by using a coupled inductor, the stray energy can be recycled by clamped capacitor into the output terminal 1 or output terminal 2 to ensure the property of voltage clamping and an auxiliary inductor is designed for providing the charge power to the load1 and assisting the switch turned on under the condition of ZCS. It gives alternative choice for converting a low voltage source to multiple boost outputs with inverted voltage output efficiently.

1.4. Field Visit

Field Visit-1

Location: Vidyagiri, Bagalkot
Pin-code: 587102

Solar Power Plant at BEC roof top

- Total Installed Capacity of Solar Power Plant : 255KW
- Total Number of SPV Modules : 851
- Total Number of Inverters : 6
- Total Number of Strings : 48
- Number of Modules per String: 18

Fig.1.5. Solar Power plant at BEC roof top

In this field visit we come to know that the type of connections between the panels. The total capacity of the solar power plant is 255KW which is located at the BEC rooftop. Total number of Inverters connected to the solar power plant is 6, in that 5 inverters are of 50KW and 1 inverter is of 5 KW. Each inverter connected with 9 strings and each string contains 18 modules. In solar power plant polycrystalline type of panels are used. Maintainance will be taken for this power plant.Solar power plant with capacity of 255KW satisfies our college load.

Specification of Module

Model	:	ELDORA VSP 72AAA.03.04
Maximum Power, P_{max}	:	$320W_p$
Open Circuit Voltage, V_{OC}	:	46.17 V
Short Circuit current, I_{SC}	:	8.95 Amps
Maximum Power Voltage, V_m	:	38.42 V
Maximum Power Current, I_{mp}	:	8.33 Amps
Efficiency	:	16.67%

Field Visit- 2

Solar Power Plant at Energy park,BEC

Fig.1.6. Solar Power plant at Energy Park, BEC

In this field visit we observed that, the type of modules used are polycrystalline and monocrystalline. Total 12 modules are installed, in that 6 modules are polycrystalline and 6 modules are monocrystalline.Total installed capacity of modules are 1980Wp. These modules are sufficient to satisfy our selected DC Loads. Specifications of the both modules are specified as below.

Specification of Polycrystalline Module

Model	:	MTK150/12V
Maximum Power, P_{max}	:	150 W_p
Open Circuit Voltage, V_{OC}	:	21.90 V
Short Circuit current, I_{SC}	:	8.81 Amps
Maximum Power Voltage, V_m	:	17.96 V
Maximum Power Current, I_{mp}	:	8.36 Amps
Maximum System Voltage	:	1000 V

Specification of Monocrystalline Module

Model	:	LFV12V180WM
Maximum Power, P_{max}	:	180 W_p
Open Circuit Voltage, V_{OC}	:	23.90 V
Short Circuit current, I_{SC}	:	9.77 Amps
Maximum Power Voltage, V_m	:	19.36 V
Maximum Power Current, I_{mp}	:	9.31 Amps
Maximum System Voltage	:	1000 V

Lab Visit-1

DC Poered Microcontroller Kit

Fig.1.7.DC Powered Microcontroller kit

In this microcontroller kit sunlight is used to avoid the battery backup. This system serves the intial and runing cost and low powered DC loads can be operated using this system. In education sysytem, the proposed work is applicable in Microcontroller kits. It is easy to implement, it can also be used in digital/ analog kits.However, it is applicable for only low power application and we are trying to test high rated DC loads with solar power.

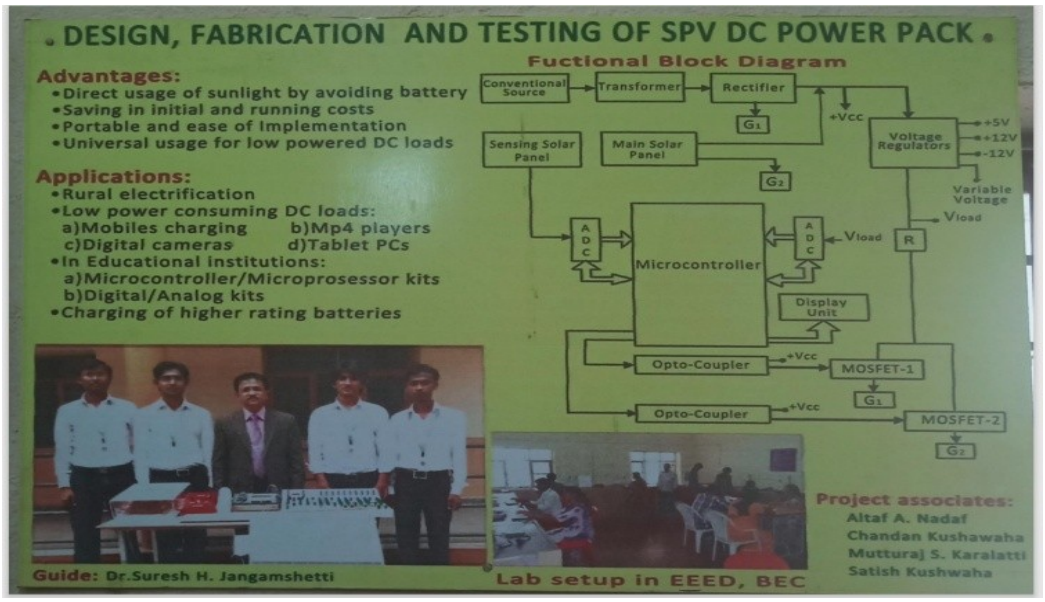

Fig.1.8. Block Diagram of SPV Powered Pack

Applications

- Rural Electrification
- Low Power Consuming DC Loads like Mobile charging, Digital Cameras etc.
- Charging of higher rating batteries

1.5. Outcomes of Literature Review

However, the effort towards making outdoor commercial stalls completely powered independent of grid connections has been proposed. Further, to develop DC power distribution systems using renewable energy sources is need of hour. In this regard, proposal aims to result in sustainable solution for small scale distribution systems for commercial and domestic applications. The core objective of this proposal is to empower the electricity for canteen/stalls located outskirts. This provision will lead to a systematic and self sustained livelihood of the many street vendors.

Based on the literature review following critical observations are made:

- Multiple output voltages can be achieved by single input voltage using SIMO converters.
- Domestic and low powered commercial appliances are compatible with DC loads with increase in efficiency.
- Performance analysis of the SIMO DC-DC converter with parallel operation of individual converters is verified by simulation.
- Many literatures presented SIMO DC-DC converter topologies. However, employment for DC distribution system in commercial applications is not proposed.
- In view of these points, project is taken up to develop the DC distribution system based on SIMO converter for canteen appliances.

It is observed that different levels of output voltages can be obtained from DC-DC Converter. In this regard the project titled **"Development and Performance Testing of SPV Powered Mobile Canteen with DC Loads"** is taken up.

1.6. Objectives

The core objectives of the proposed system are to solve and eradicate the electricity supply problems of remotely located people/outdoor vendors trough SPV powered DC distribution system. Specific objectives are:

- To develop DC distribution system employed for mobile canteen using SIMO DC-DC Converter
- To test the performance of proposed circuit with different DC loads.

1.7. Thesis Organization

The thesis consists of nine chapters. Chapter one presents the introduction to DC distribution system, about DC-DC Converter, motivation to carry out this project, Literature Survey, Outcomes of literatures and thesis organization. Chapter two presents types of DC-DC Converter and Review on Single Input Multiple Output DC-DC Converter. Chapter three presents the DC loads employed in mobile canteen. Chapter four presents the methodology and proposed Block diagram and Design of DC-DC converter. Chapter five presents the calculation of DC-DC Converter components. Chapter six presents description of Electric cart and it's dimensions. Chapter seven presents DC distribution system, it's advantages and proposed wiring diagram for mobile canteen. Chapter eight presents the testing results of DC-DC Converter with DC loads. Chapter nine presents the conclusion and future scope.

CHAPTER-2

DC-DC CONVERTER

This chapter represents the different types of DC-DC Converters and Review on Single Input Multiple Output DC-DC Converters.

2.1 Types of DC-DC Converter

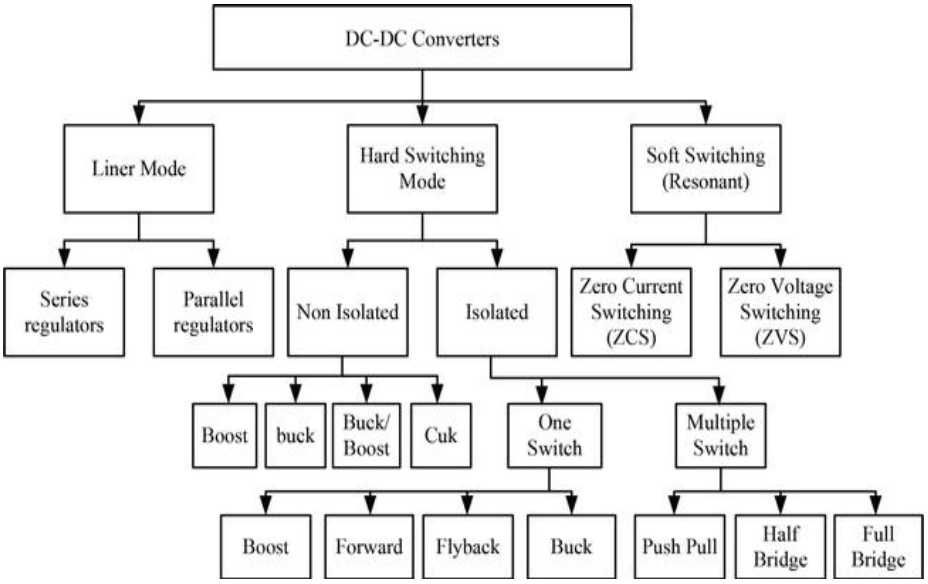

Fig.2.1 Classification of DC-DC Converter

1. Linear Mode DC-DC Converter

Linear voltage regulators deliver a stable output voltage from a more or less stable input voltage source. In normal operation, even if the input voltage fluctuates rapidly, the output voltage remains stable. This means they can also very effectively filter out input ripple, not only at the fundamental frequency, but also as far as the fifth or tenth harmonic. The limitation is only the reaction speed of the internal error amplifier feedback circuit.

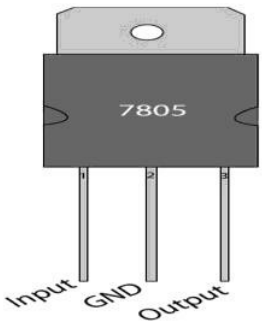

Fig.2.2 Pin diagram of 7805 Linear Regulator

There are two types in linear mode DC-DC Converter

A. Series Regulator: Series regulators are the more common form; they are more efficient than shunt designs. The series regulator works by providing a path from the supply voltage to the load through a variable resistance, usually a transistor, it is in the "top half" of the voltage divider - the bottom half being the load. The power dissipated by the regulating device is equal to the power supply output current times the voltage drops in the regulating device. For efficiency and reduced stress on the pass transistor, designers try to minimize the voltage drop but not all circuits regulate well once the input (unregulated) voltage comes close to the required output voltage; those that do are termed Low Dropout regulators, A series regulator can usually only source current, unlike shunt regulators. Fig.2.3 represents the circuit diagram of Series Regulator.

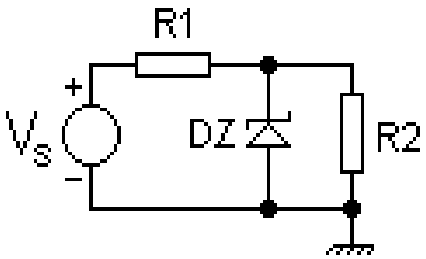

Fig.2.3 Series Regulator

B. Parallel Regulator: The parallel regulator works by providing a path from the supply voltage to ground through a variable resistance. The current through the shunt regulator is diverted away from the load and flows directly to ground, making this form usually less efficient than the series regulator. It is, however, simpler, sometimes consisting of just a voltage-reference diode, and is used in low-powered circuits where the wasted current is too small to be of concern. This form is very common for voltage reference circuits. A shunt regulator can usually only sink current.

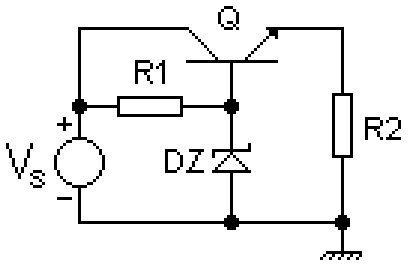

Fig2.4 represents Circuit diagram of Parallel Regulator.

Hard Switching Mode DC-DC Converter

Hard-Switching is simply forcing the transistor to turn on and off by adding the current or voltage to the third pin to enable the changed states. It is known to be hard on transistors and shortens their useful life. Hard switching is easy to understand and therefore is used

almost universally in power converters outside of the low power DC-DC space. Hard switching is thought to be low-cost because only a limited number of other components are required to drive the transistors between states. In reality, hard-switching is expensive at the system level and inefficient.

Hard switching Mode can be divided into two main groups

A. Non isolated DC-DC Converter: The input sources and the output load share a common current path during operation.

Non isolated DC-DC Converter are divided into four types:

i. **Buck Converter**: The buck converter is a commonly used in circuits that steps down the voltage level from the input voltage according to the requirement. It has the advantages of simplicity and low cost. Figure.2.5 shows a buck converter the operation of the Buck converters starts with a switch that is open. When the switch is closed, the current flows through the inductor, slowly at first, but building up over time. When the switch is closed the inductor pulls current through the diode, and this means the voltage at the inductors "output" is lower than it first was. This is the very basic principle of operation of buck circuit.

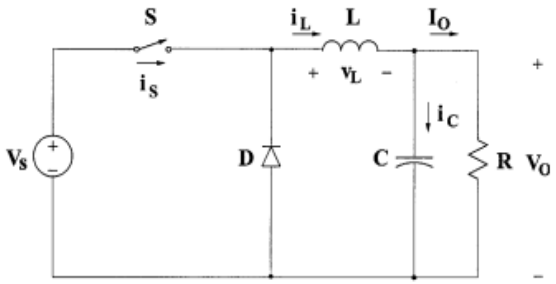

Fig.2.5 Circuit diagram of Buck converter

Operating principle: - The key to the analysis for determining the voltage Vo is to examine the inductor current and inductor voltage first for the switch closed and then for the switch open. The net change in inductor current over one period must be zero for steady state operation. The average inductor voltage is zero. There are two types of operational mode for this circuit a) Continuous Conduction Mode and b) Discontinuous Conduction Mode. They are described as below

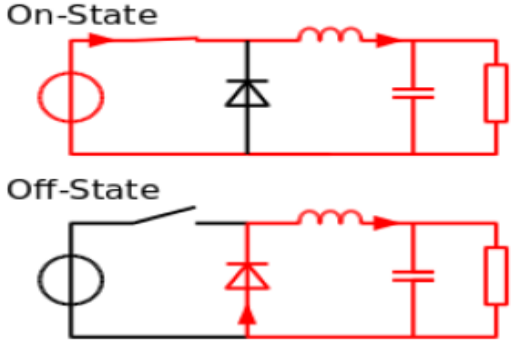

Fig.2.6 Operation of Buck converter

(a) Continuous Conduction Mode: A buck converter operates in continuous mode if the current through the inductor (IL) never falls to zero during the commutation cycle. In this mode, the operating principle is described by using Fig.2.6.

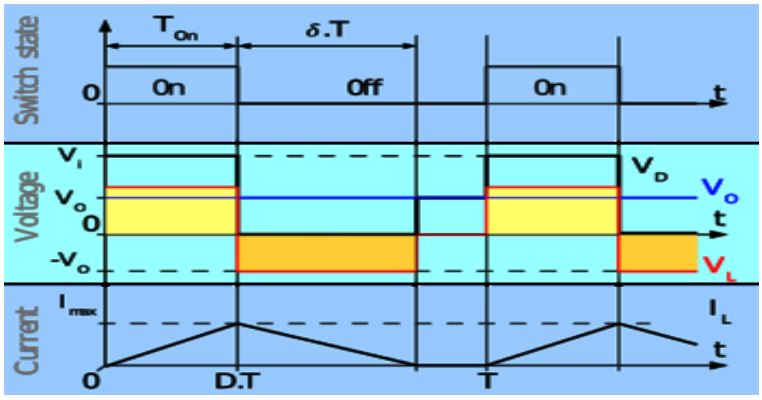

Fig.2.7 Continuous conduction mode of Buck converter

• When the switch pictured above is closed, the voltage across the inductor is VL = Vi − Vo. The current through the inductor rises linearly. As the diode is reverse-biased by the voltage source V, no current flows through it.

• When the switch is opened, the diode is forward biased. The voltage across the inductor is VL = − Vo (neglecting diode drop). Current IL decreases.

(b) Discontinuous Conduction Mode: - In some cases, the amount of energy required by the load is small enough to be transferred in a time lower than the whole commutation period. In this case, the current through the inductor falls to zero during part of the period. The only difference in the principle described above is that the inductor is completely discharged at the end of the commutation cycle.

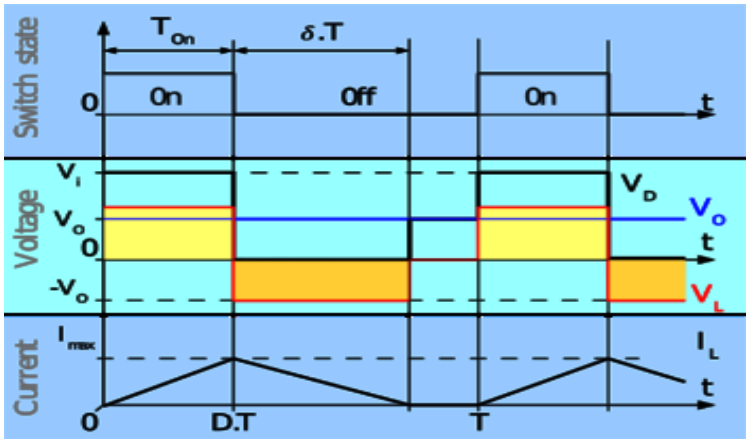

Fig.2.8 Discontinuous conduction mode of Buck converter

ii. Boost Converter: A boost converter (step-up converter) is a power converter with an output DC voltage greater than its input DC voltage. It is a class of switching mode power supply (SMPS) containing at least two semi-conductors' switches (a diode and a transistor) and at least one energy storage element. Filters made of capacitors (sometimes in combination with inductors) are normally added to the output of the converter to reduce output voltage ripple A simplified circuit diagram is shown in Fig 2.9.

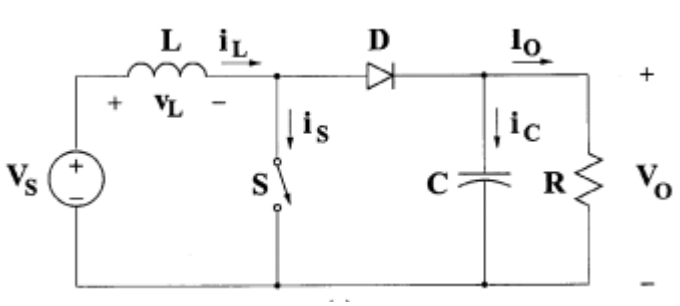

Fig.2.9 Circuit diagram of Boost converter

Operating principle: - The key principle that drives the boost converter is the tendency of an inductor to resist changes in current. When being charged it acts as a load and absorbs energy. When being discharged it acts as an energy source. The voltage it produces during the discharge phase is related to the rate of change of current, and not to the original charging voltage, thus allowing different input and output voltages.

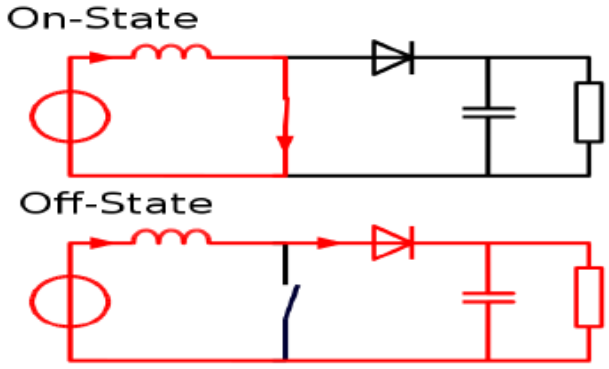

Fig.2.10 Operation of Boost converter

The basic principle of a Boost converter consists of 2 distinct states

• In the On-state, the switch S is closed, resulting in an increase in the inductor current.

• In the Off-state, the switch S is open and the only path offered to inductor current is through the flyback diode D, the capacitor C and the load R. These results in transferring the energy accumulated during the On-state into the capacitor.

• The input current is the same as the inductor current. So, it is not discontinuous as in the buck circuit and the requirements on the input filter are relaxed compared to a buck converter.

(a)Continuous Conduction Mode: When a boost converter operates in continuous mode, the current through the inductor (IL) never falls to zero. The typical waveforms of currents and voltages in a converter operating in this mode.

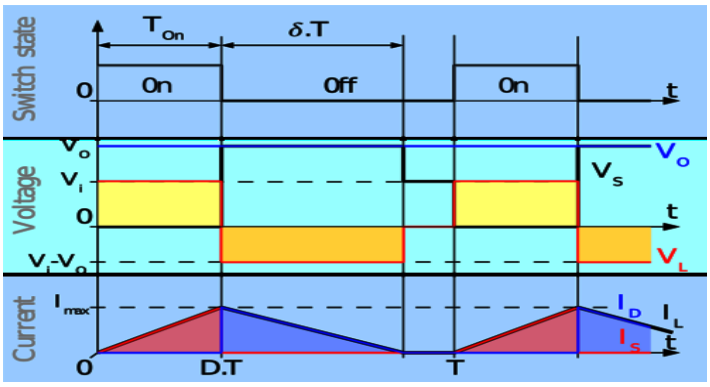

Fig.2.11 Continuous conduction mode of Boost converter

(b)Discontinuous Conduction Mode: - In some cases, the amount of energy required by the load is small enough to be transferred in a time smaller than the whole commutation period. In this case, the current through the inductor falls to zero during part of the period. The only difference in the principle described above is that the inductor is completely discharged at the end of the commutation cycle.

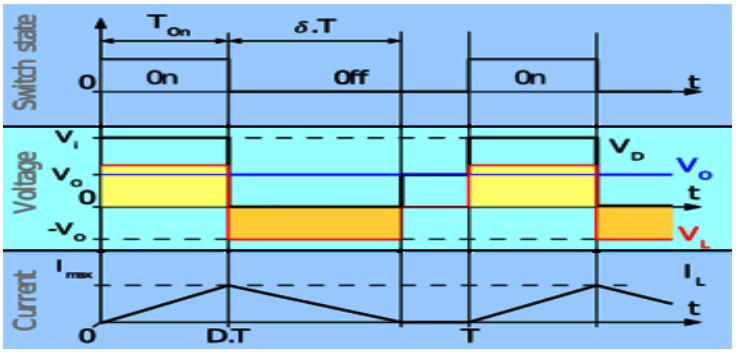

Fig.2.12 Discontinuous conduction mode of Boost converter

iii. Buck-Boost Converter: - Another basic switched mode converter is the buck-boost converter. The output of the buck-boost converter can be either higher or lower than the input voltage. Assumption made about the operation of this circuit is same as it was for the previous converter circuits.

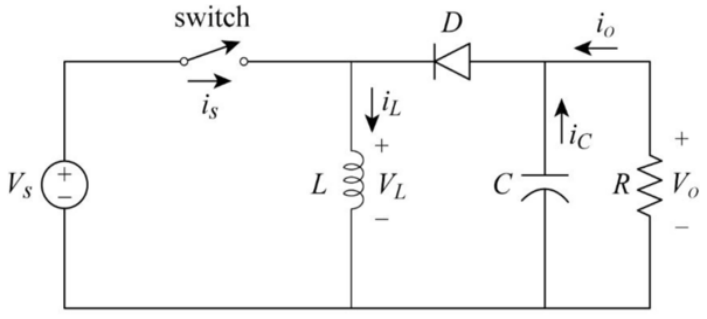

Fig.2.13 Circuit diagram of Buck-Boost converter

Operating principle: - The two operating states of a buck–boost converter: When the switch is turned-on, the input voltage source supplies current to the inductor, and the capacitor supplies current to the resistor (output load).When the switch is opened, the inductor supplies current to the load via the diode D.

• While in the On-state, the input voltage source is directly connected to the inductor (L). This results in accumulating energy in L. In this stage, the capacitor supplies energy to the output load.

• while in the Off-state, the inductor is connected to the output load and capacitor, so energy is transferred from L to C and R. Compared to the buck and boost converters, the characteristics of the buck–boost converter are mainly:

- polarity of the output voltage is opposite to that of the input;
- The output voltage can vary continuously from 0 to (for an ideal converter). The output voltage ranges for a buck and a boost converter are respectively 0 to and to. The circuit has two main modes of operations. They are described below.

(a) Continuous Conduction Mode: - If the current through the inductor L never falls to zero during a commutation cycle, the converter is said to operate in continuous mode.

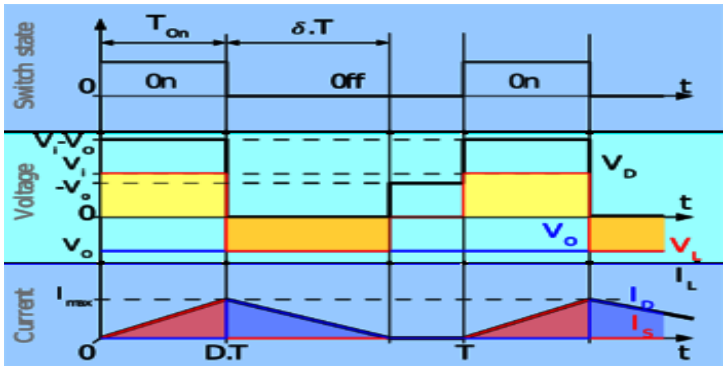

Fig.2.14 Continuous conduction mode of Buck-Boost converter

(b)Discontinuous Conduction Mode: - In some cases, the amount of energy required by the load is small enough to be transferred in a time smaller than the whole commutation period. In this case, the current through the inductor falls to zero during part of the period. The only difference in the principle described above is that the inductor is completely discharged at the end of the commutation cycle.

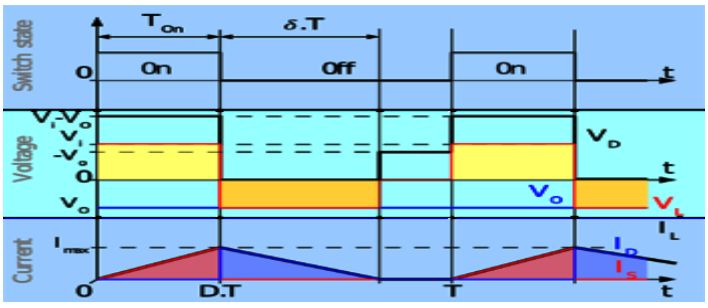

Fig.2.15 Discontinuous conduction mode of Buck-Boost converter

iv. Cuk Converter: - The Cuk converter is used for getting the output voltage with different polarity. That means output voltage magnitude can be either larger or smaller than the input, and there is a polarity reversal on the output. The inductor on the input acts as a filter topologies where energy transfer is associated with the inductor. Energy transfer for the Buck converter depends on the capacitor C1. The primary assumptions for this circuit analysis are as before. It also has two modes of operation which are described below.

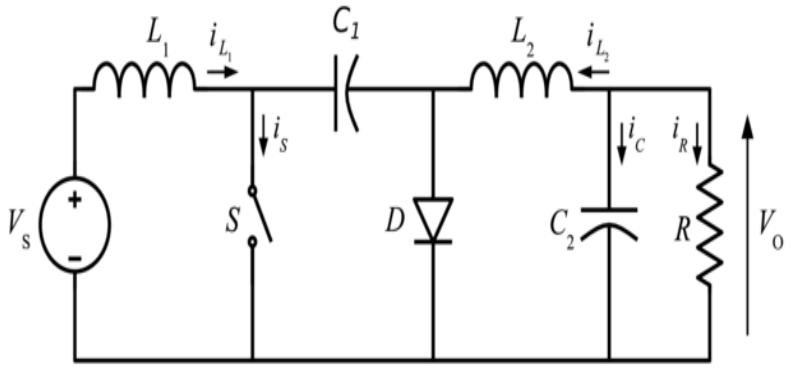

Fig.2.16 Circuit diagram of Cuk converter

Operating principal: - The two operating states of a non-isolated Cuk converter. In this figure, the diode and the switch are either replaced by a short circuit when they are on or by an open circuit when they are off. It can be seen that when in the Off state, the capacitor C is being charged by the input source through the inductor L1. When in the on state, the capacitor C1 transfers the energy to the output capacitor through the inductance L2. A non-isolated Cuk converter comprises two inductors, two capacitors, a switch and a diode. Its schematic can be seen in figure.2.16. It is an inverting converter, so the output voltage is negative with respect to the input voltage. The capacitor C is used to transfer energy and is connected alternately to the input and to the output of the converter via the commutation of the transistor and the diode. The two inductors L1 and L2 are used to convert respectively the input voltage source (VS) and the output voltage source (C2) into current sources. Indeed, at a short time scale an inductor can be considered as a current source as it maintains a constant current. This conversion is necessary because if the capacitor were connected directly to the voltage source, the current would be limited only by resistance, resulting in high energy loss. Charging a capacitor with a current source prevents resistive current limiting and its associated energy loss.

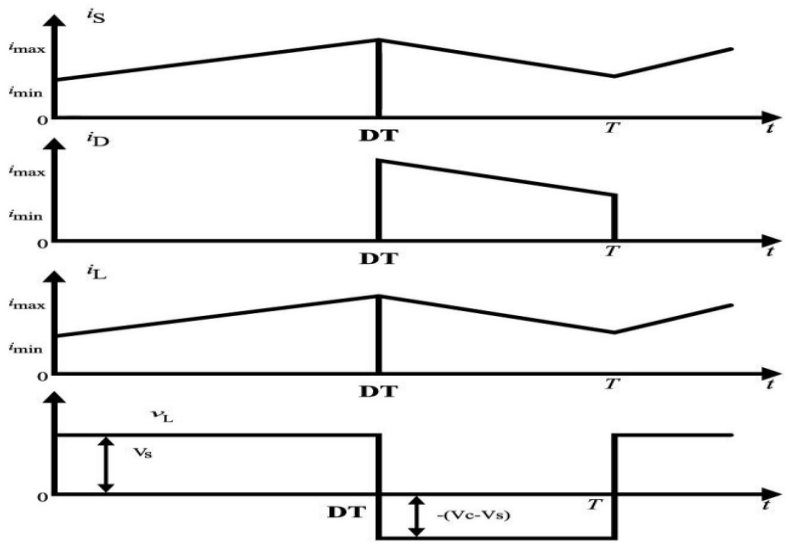

Fig.2.17 Waveform of Cuk converter

B. Isolated DC-DC Converter: - In the family of isolated DC-DC converters there is a variety of topologies, but only three of them are applicable to the discussion of modern DC-DC converters. This section will limit its consideration to flyback, forward and push-pull converter topologies. In these types of isolated converters, the transfer of energy from input to the output is performed via a transformer. As with the non-isolated converters regulation is performed by the PWM controller, again by monitoring the output voltage in the feedback loop, but via an isolating stage. Ideal components are again assumed. The other difference between transformer-based isolated converter topologies and the non-isolated topologies discussed previously is that the buck, boost or buck-boost function can be achieved with the transformer winding ratio, so freeing up the PWM driver to operate as a simple energy packet controller transferring more or less energy from input to output according to input voltage and output load requirements only.

i. Flyback converter: - The Flyback Converter converts an input voltage into regulated output voltage by storing energy in the transformer core during the on time when transforming it to the secondary during in on time as shown in the fig.2.18.

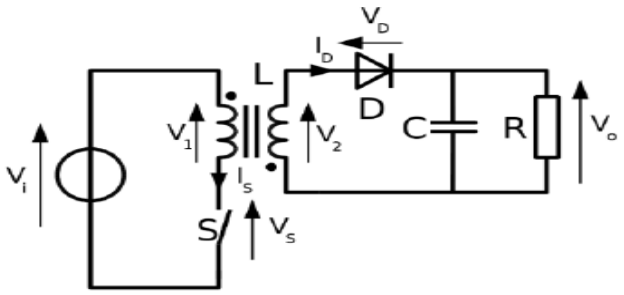

Fig.2.18 Circuit diagram of Flyback converter

Working: - When switch S is closed, a current flow IS through the primary winding of the transformer T1 with an inductance of LP with a rise rate of VIN/LP. During this time, no current flows through the secondary winding LS to the load. The load current is provided at this time by the capacitor C. When S opens, the collapsing magnetic field in the transformer causes the voltages at the primary and secondary windings to change their polarity. The energy stored in the primary winding is now transferred to the secondary winding. The secondary voltage rises sharply and a pulse of current flows into the load and C, decreasing at the rate VOUT/LS. The diode D acts as a peak rectifier.

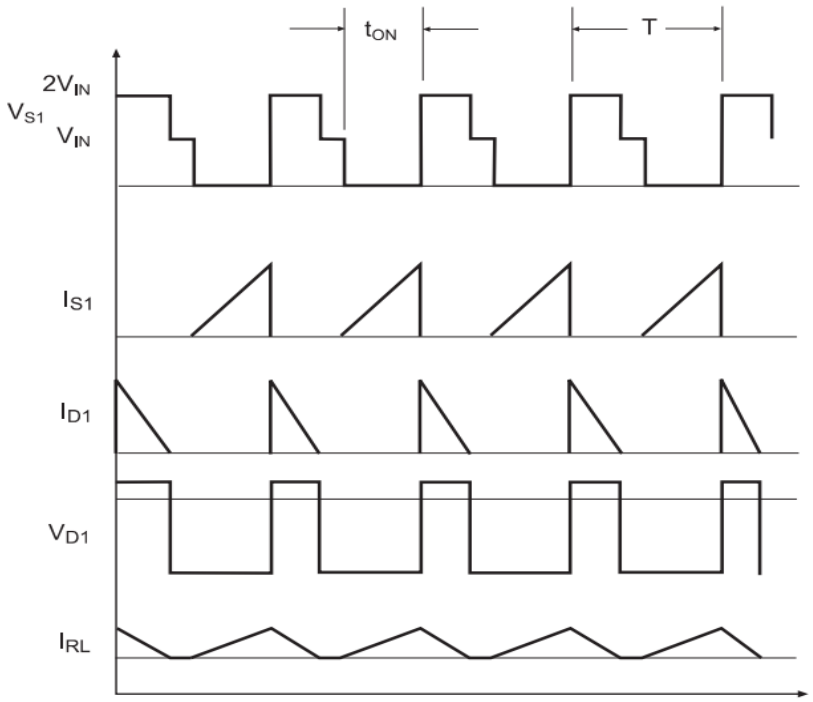

Fig.2.19: Waveform of Flyback converter

i. **Forward Converter: -** Although the forward converter seems similar to the flyback topology, it functions in a completely different way. The input voltage is converted into a regulated output voltage as a function of the turn's ratio of the transformer.

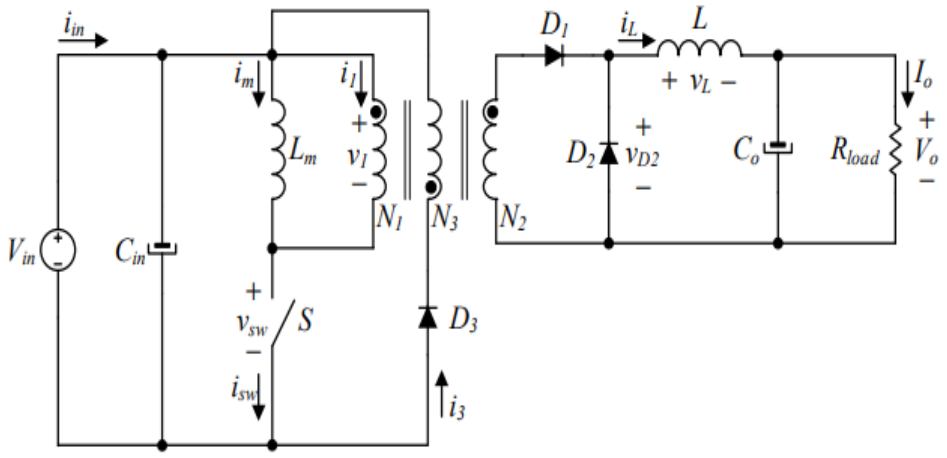

Fig.2.20: Circuit diagram of Forward converter

Working: - As in the flyback topology, when switch S is closed, a current IS1 flows through the primary winding of the transformer N1 with an inductance of LP with a rise rate of VIN/LP. The rising primary current induces a secondary current in the transformer N1 due to the coupling between the primary and secondary windings, with a voltage magnitude of VIN/N. The secondary current flows through the rectifying diode D1 and the output inductor L1, rising with a rate equal to VIN/(L1 N). This current also flows into the load RL and the output capacitor Co. Thus, the voltage across the capacitor Cin rises until the upper regulation threshold is exceeded and a 'stop' signal is sent (the feedback signal is usually via an optocoupler). The primary side controller then causes S to open, and the current flow from the voltage source is interrupted. The reset winding with diode D3 stops the transformer magnetic field from collapsing, but instead allows the current to decay at the same rate as it rose when S was closed. As a result, when S opens, a polarity reversal occurs at the secondary winding and the negative current decreases with the rate VOUT/L1 and flows through the catch diode D2 and the inductance L1 and finally flow into load and Co. The voltage across Cin decreases until such time as the lower control limit of the regulation is reached. A 'start' signal is sent, S is closed again and a new cycle begins.

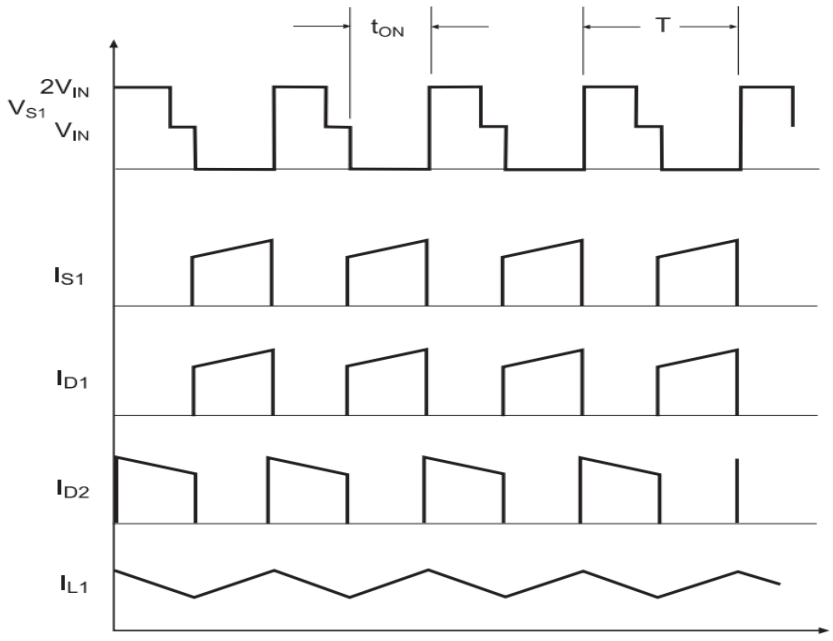

Fig.2.21: Waveform of Forward converter

iii. Push-Pull Converter: - The Push-Pull Converter converts an input voltage input a lower or higher output voltage but requires a split winding transformer to function.

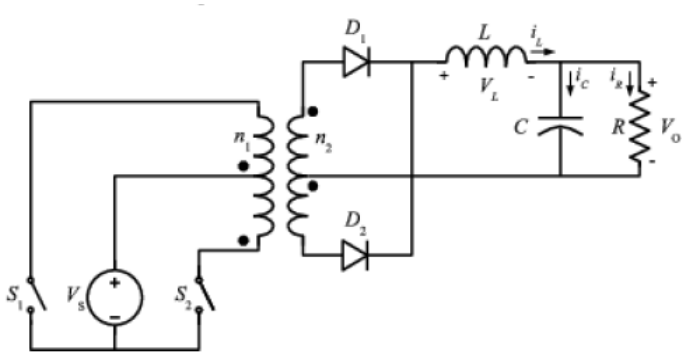

Fig.2.22: Circuit diagram of Push-Pull converter

Working: - When switch S1 is closed, the current increases through the primary winding of the transformer with approximately linear slew rate Vs/LT1. Simultaneously, a voltage Vs/N is set up at the secondary winding n2 due to the coupling of the primary and the secondary winding of the transformer. The secondary current flowing through the rectifying diode D1 and the output inductor L1, increases linearly at the rate of (Vs/N - VO)/L1. This current also flows into the load RL and charges the output capacitor C1. When S1 is opened, a polarity reversal occurs, but diode D1 blocks the negative voltage on the secondary winding n1. However, current continues to flow through L1 via diode D2 from the inverted secondary winding n1. The current now decreases linearly in proportion VO/L1. S2 is then closed and the cycle begins again, but with the secondary winding n1 providing the current while S2 is closed. Since the Duty Cycle is for both S1 and S2 closed to 50% it is very important to make sure that the two switches cannot be switched on simultaneously otherwise very high short circuit current would flow therefore a suitable dead time is required between the opening of one switch and closing of the other.

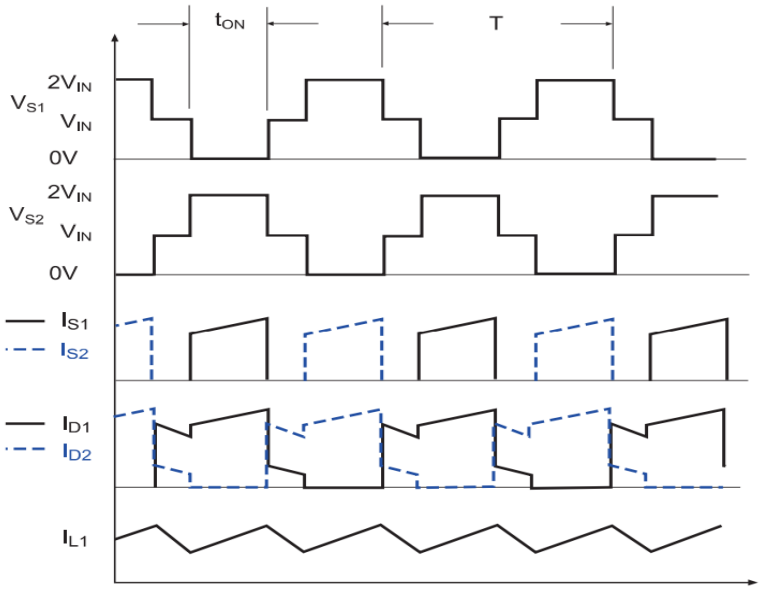

Fig.2.23: Waveform of Push-Pull converter

iv. Half Bridge and Full Bridge: - A similar topology to the push-pull converter is the half bridge and full bridge converters, which use two or four switches to steer the current through the transformer primary winding, which no longer needs the primary Centre-tap connection as with the push-pull converter (but still uses a centre-tap secondary).

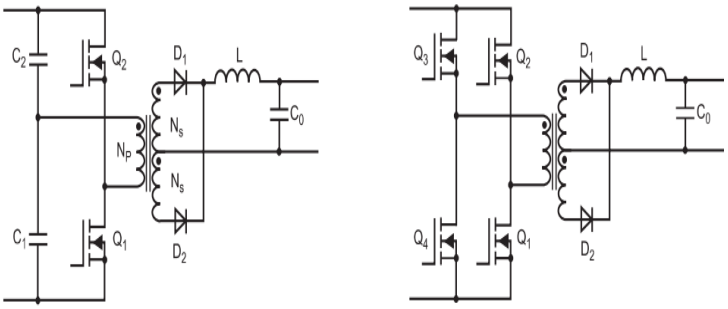

Fig.2.24: Circuit diagram of Half and Full Bridge converter

Soft Switching Mode DC-DC Converter

Soft Switching mode power converter are used in a wide variety of application. In most applications, it is desirable to design high frequency switching power converters to increase their power density. However, the switching losses are increased by increasing the frequency. Moreover, large dv/dt and di/dt produce electromagnetic interference.

soft switching is classified into two types:

i. Zero Current Switching (ZCS): - ZCS can eliminate the switching losses at turnoff and reduce the switching losses at turn-on. As a relatively large capacitor is connected across the output diode during resonance, the converter operation becomes insensitive to the diode's junction capacitance. When power MOSFETs are zero-current switched on, the energy stored in the device's capacitance will be dissipated. This capacitive turn-on loss is proportional to the switching frequency.

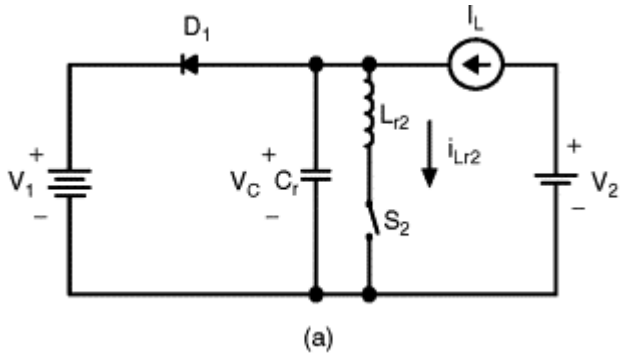

Fig.2.25 Circuit diagram of Zero current switching

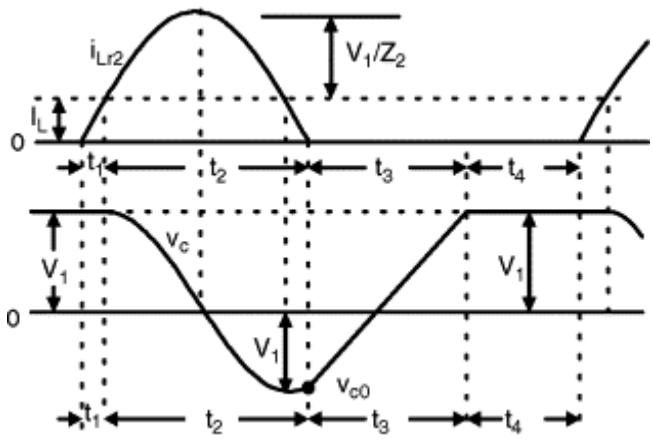

Fig.2.26 Waveform of Zero current switching

i. **Zero Voltage switching: -** Zero-voltage switching can be described as the power to the device is turned off or on only when the output voltage is zero volts. Using this technique, zero-voltage switching can effectively reduce losses and this technique can be applied to create the most power-conversion designs.

Zero Voltage Switching can extend the life of a controller and of the load being controlled. All of its switches for all transitions because of its high switching frequency capability, high efficiency, and simple architecture, it can provide very high-power density.

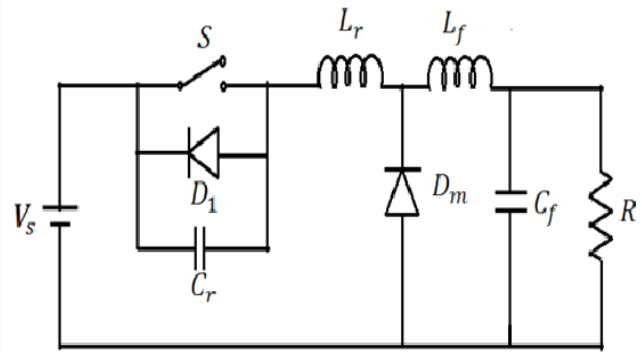

Fig.2.27 Circuit diagram of Zero voltage switching

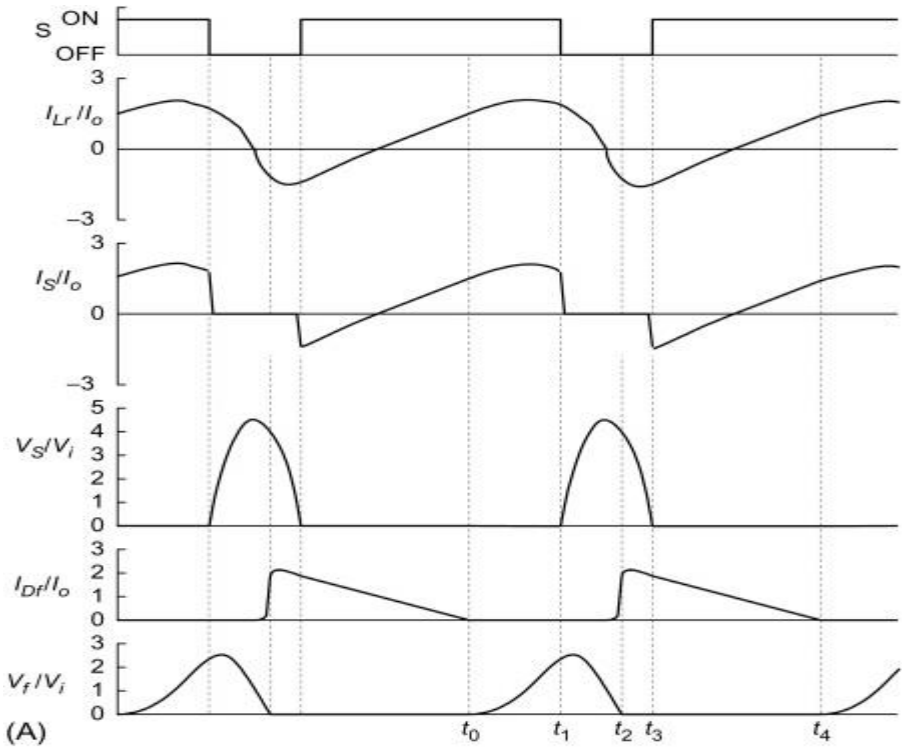

Fig.2.28 Waveform of Zero Voltage switching

2.2 Review on Single Input Multiple Output DC-DC Converter

DC-DC converter circuit is a high frequency power conversion circuit that uses inductor, and capacitor to smooth out switching noise into Regulated DC voltage. Closed feedback loop maintains constant voltage output even when changing input voltage and output current. This converter is used to reduce high voltage input to low voltage or low voltage to high voltage for some specified applications. They are also used to isolate some highly sensitive components in a circuit from other components of the circuit to avoid any kind of damage. This converter is widely used as variable voltage DC power supply. Single input multiple outputs DC-DC converter is more suitable for certain application such as military, aeronautics, renewable energy. Different single input multiple outputs DC-DC converter is use to get multiple output from single input. The operating modes of the outputs of SIMO converter must change to maintain a constant supply voltage if the state of charge of a battery is altered during operation of the converter. The limited capacitance of the filtering capacitors connected in shunt to each output to limits a current driving capacity. The converter having one input source and multiple output voltages which requires high switching frequency to achieve small size of inductor and capacitor. Use of high switching frequency can also increases switching losses as well as decreases efficiency of the converter .to overcome this problem some soft switching techniques are used which can be

operated at high switching frequency those are Zero Voltage Switched and Zero Current Switched. In these techniques any one voltage or current will be zero in the process of the converter, by this power supply accuracy is increased. The low turn on resistance MOSFET is used to decrease the conduction loss.

CHAPTER-3

DC Loads Employed in Mobile Canteen

This chapter presents the detailed specification of selected DC loads for mobile canteen.

3.1. Loads and their specification details

Fig.3.1. Solar induction stove

- ZVS Induction Heating Board Module
- Voltage: 12-48 V, Wattage-1800W.
- Good heat dissipation with coil accessories

Fig.3.2. Table Fan with Inbuilt LED

- Prabha Solar 15W DC 12V inbuilt LED light without Oscillations.
- Input Voltage 12V, Current 1.7-2Amps.
- For general use in Hotels, shops , offices and homes.
- Easy to handle, heavy powder coated grill.

Fig.3.3. Pedestal Fan

- Operates on DC 12 V, 7 AH Battery, 2.8-3.7Amps.
- It is very light and portabledevice and they can be moved with ease.
- Used in Homes or even Outdoors or a room that requires additional ventilation.

Fig .3.4.LED Bulbs

- 12V, 7W DC LED B22 type Holder Bulb with inbuilt heat sink.
- Suitable for residential Rooms, petty Shops, rural shops and farm House.

Fig.3.5. Electric Motor

- Robodo M37 24V 350W Electric Motor for Electric bike, Electric Tricycle.
- Wattage-350W, Rotation-2650rpm, Torque-2.5-4N.M.
- Efficiency>75%.
- Used in Scooter and Small Electric motorcycle.

Fig.3.6. Electric Motor

- Xculma My1016Z2 24V, 250W electric motor.
- No-Load Current:<2A, No Load Speed:3850 RPM Rated torque:0.80N, Efficiency:78%.
- Used in Elevators, Steel Mills, Rolling Mills etc.

CHAPTER-4

METHODOLOGY

This Chapter presents the steps involved in methodology, proposed block diagram and description of components.

4.1. Methodology Steps

The proposed methodology includes three main steps:

Step1: Selection of DC loads:

There are many DC appliances which can be used by street vendors in their mobile canteen which basically use DC power. These loads can be directly operated through DC voltages in DC distribution system. In this regard the loads are listed and their respective DC ratings are assessed. Further, desired voltage levels for loads are selected. Table 1. shows the selected DC loads and their specifications.

Table 4.1 DC loads and their specifications.

Sl.	DC Loads	Ratings
1	Solar Induction Stove	12-48V, 1800W,40A
2	Solar DC fan with inbuilt LED	12V,15W
3	BLDC ceiling fan	12V, 60W
4	Solar pedestal fan	12V,42W
5	LED Bulbs	12V, (5,7,10,12&15W), 48V(9W)
6	DC Motors	24V, 250W

Table 4.2 Determination of Connected Load and their energy estimation

SI	DC Loads	Ratings(W)	Number	Total Watt (W)	No.of hours per day	Energy/day (Wh)
1	Solar Induction Stove	1800W	1	1800	13	23400
2	Solar DC fan with inbuilt LED	15W	1	15	6	90
3	Solar Pedestal fan	42W	1	42	6	252
4	DC Motors	250	2	500	2	1000
5	LED bulbs	12V, (5,7,10,12& 15W), 48V(9W)	1	58	4	232
	Total	-	6	2415	31	24.974K Wh

Table 4.2 shows the determination of connected load and it's energy estimation, which helps to select the number solar modules to satisfy the selected loads for mobile canteen

Step 2: Design of DC-DC converter:

DC-DC converter with single input multiple outputs will be developed 12 volts input is provided from SPV panels. DC-DC converter will result in different voltages of 12 V, 24 V, 32/36 V and 48 Volts. Here DC-DC converter unit consist of four DC-DC boost converters each of rating 20 Amps which are connected in parallel to get different voltage levels and high current of approximately 60 Amps. Loads are connected to respective voltage terminals. Further, battery will be employed for operation during non-sunshine hours.

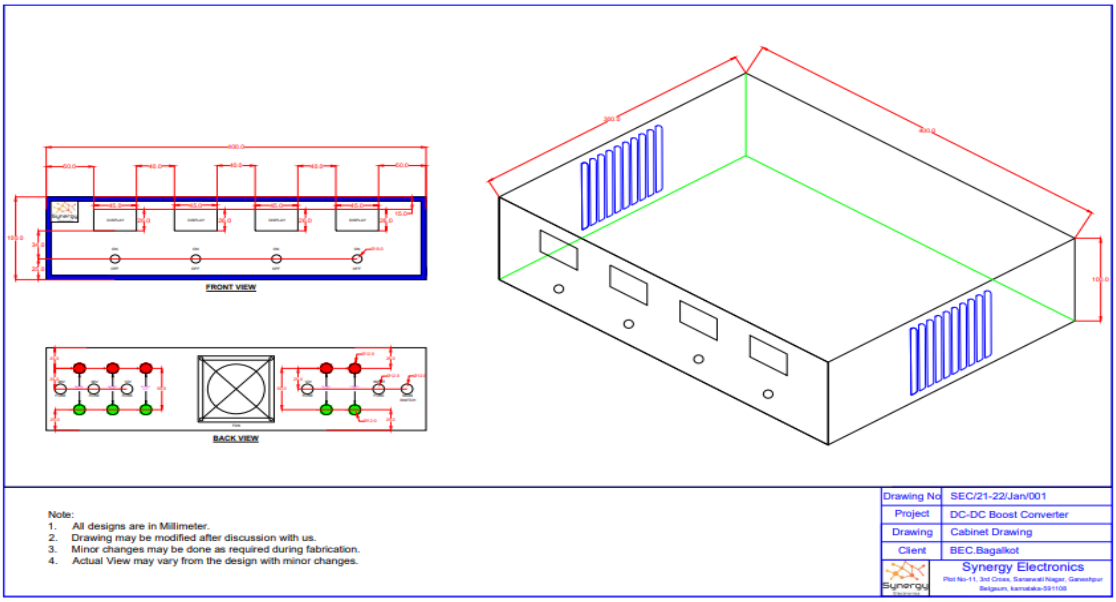

Fig.4.1. Front and Back View of DC-DC Boost Converter

Step3: Interconnection of Components:

All the components of the project are interconnected and tested for the performance of the designed DC-DC Converter for the different DC loads.

4.2. Block Diagram

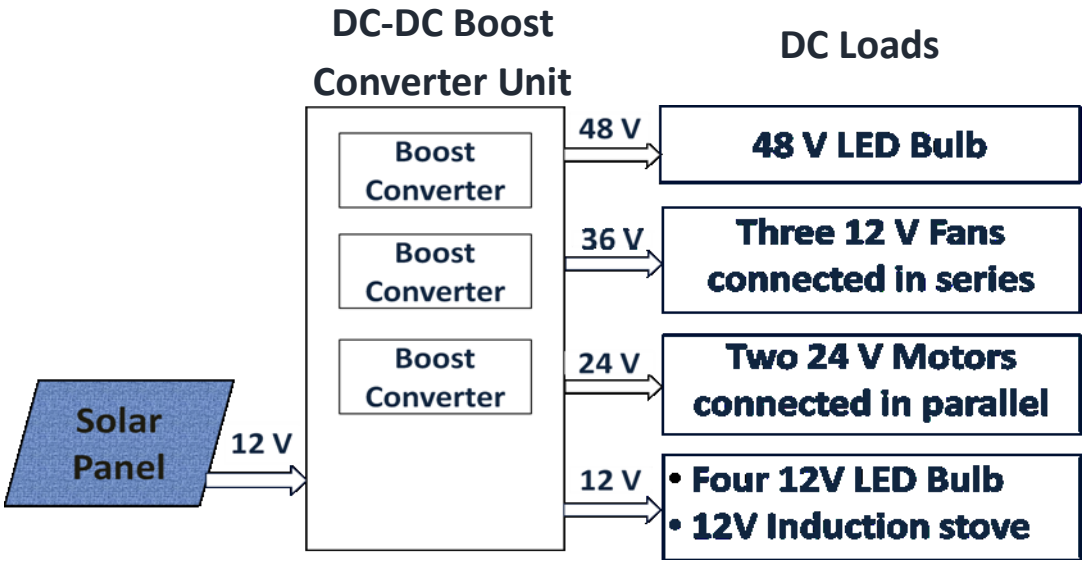

Fig.4.2.Proposed block diagram

The functional block diagram of proposed model as shown in the Fig 1.The block diagram consists of solar module, DC-DC Converter and Domestic and Commercial DC loads. The description of components listed below:

4.3. Description of components:

1. Solar Module:

Solar module is a single photovoltaic panel that is assemble of connected solar cells. The solar cell absorbs sunlight as source of energy to generate electricity. Polycrystalline solar modules are made of PV cells comprising of numerous small silicon crystals. Polycrystalline modules are most cost-effective but less efficient than the monocrystalline solar PV modules. Monocrystalline solar panels occupy very less space and space efficient. The cells in monocrystalline solar panels are highly efficient in their electricity bearing capacity. Solar Photovoltaic panels of 1980W are available for experimentation. 6 numbers of monocrysatlline panels with 180W, 12V and Polycrystalline panels with 150W, 12V are connected for parallel operation.

Fig.4.3. Solar Power Plant at Energy Park BEC

Table 4.3 Specification of monocrystalline type SPV module

Module	LFV12VS180WM
Product ID	I180LFFS2CO2321
P_{max}	180 W_p
V_{max}	21.99 v
I_{max}	8.32 A
V_{oc}	24.04 V
I_{sc}	9.74 A
Efficiency	21.38%
Fill Factor	78.15 %

Table 4.4 Specification of polycrystalline type SPV module

SN	21ICBHOAA21450030
P_{max}	150 W_p
V_{max}	18.502 v
I_{max}	8.206 A
V_{oc}	22.638 V
I_{sc}	8.601 A
Efficiency	15.27 %
Fill Factor	77.96 %

2. DC-DC Converter:

Boost converters are also known as step-up choppers are the type of choppers circuits provides such as an output voltage that is more than the supplied input voltage. In case of boost converters, the DC-DC conversion takes place in any way that the circuit provides a high magnitude of output voltage than the magnitude of the supply input. DC-DC converter with single input multiple outputs will be developed. 12 volts input is provided from SPV panels. DC-DC converter will result in different voltages of 12 V,24 V, 32/36 V and 48 Volts. Here DC-DC converter unit consist of three DC-DC boost Converters each of rating 20 Amps which are connected in parallel and parallel operation is carried out to get different voltage levels and high current around 72 Amps. The loads are connected to respective voltage terminals and the desired voltage can be obtained by varying the potentiometer.

Fig.4.4.Front view of DC-DC converter

Fig.4.5.Back view of DC-DC converter

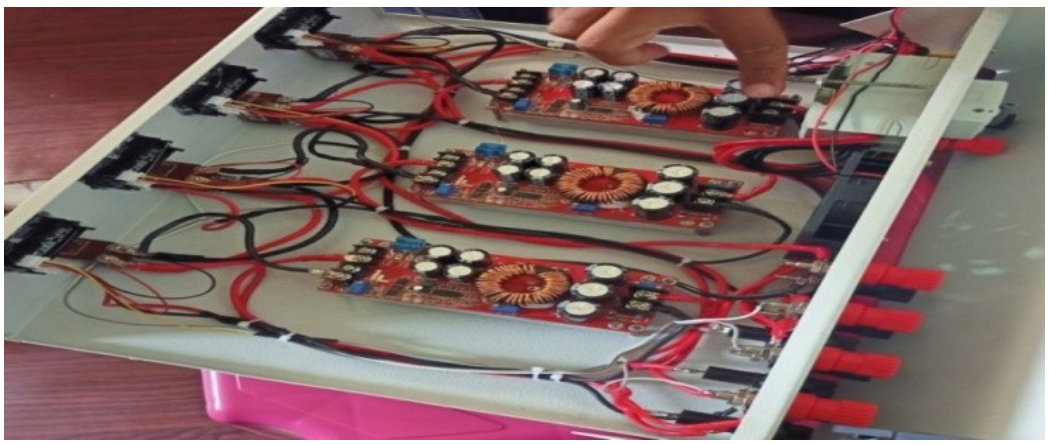

Fig.4.6. Inside view of DC-DC converter

Working principle:

In this DC-DC converter unit it consists of three boost converters. 12V input is directly given to input of DC-DC converter and 12V volt output is obtained at the first output terminal of the unit without using boost converter. Other three outputs such as 24V, 36V & 48V is obtained by using boost converters.

Each boost converter contains three input capacitors, four output capacitors, MOSFET, inductor, resistor, diode and potentiometer. Here Input capacitors are of 470µF, 100V are connected in parallel, output capacitors are of 470µF, 63V are also connected in parallel and inductor and resistor has a predesigned value.

Let us see the working principle of each boost converter, the output capacitor is charged to the input voltage minus one diode drop. Now turn on the switch, signal sourcesgo high turning on the MOSFET. The total current is diverted through to the MOSFET and through the inductor. The output capacitors remain charged since it can't discharge through the back bias diode. The power source is not immediately short circuited, since the inductor makes the current ramp up relatively slowly. Also, magnetic field builds up around the inductor. Now the MOSFET is turned off and current flowing through the inductor is stopped abruptly. The inductor has characteristic of maintaining smooth current flow that means the current flowing through the inductor does not changes suddenly. So it does not like sudden turning of the current. It results in generating a large voltage with the opposite polarity of the voltage originally supplied to it using the energy stored in the magnetic field to maintain that current flow. Now inductor starts to act as a voltage source in series with the supply voltage. This means that the voltage at the anode of the diode is higher than the voltage at the cathode of the diode and diode is in forward biased. Now the output capacitor is charged to a higher voltage than before hence successfully stepped up a lower DC voltage to higher DC voltage.

Here all the three boost converters have same ratings and same working principle. The desired voltage can be obtained by varying potentiometer. By connecting these three boost converters in parallel we get total output current of 60 Amperes. This DC-DC converter can operate up to 72 V.

3. DC Loads:

DC Loads used in small scale canteens/hotels are considered for the testing the performance of DC-DC converter and the entire DC distribution system.

i. Solar Induction Stove

The induction stove uses the low-voltage DC power supply 12-48 V with maximum current of 20 Amperes, maximum power 100 V. Because of it's moderate power, can be used for small parts of DIY players do hardening, annealing and other heat treatment.Also it can be used with a graphite crucible melting gold, silver, copper, aluminium and other metals.

Inside diameter of the coil: 40mm

Height of the coil: 50mm

The higher the voltage, the greater the heating current when the same thing, the effect is better, but at the same tie heart is also large, so to eradicate the actual situation to select the input voltage. It suits 12-36V power supply.

Working principle:

The kit contains full set of driving circuit elements and brass. The circuit board using double-sided fibre glass board, mainly copper traces are used to widen use the entire back surface of the resonant circuit common, continuous work, add a fan to blown down from above, to the resonance capacitors and other components to cool. The use of switching power supply is due to the high power are generally slow start function, which just opened machine output voltage is slowly rising while it is turned on before the induction heating circuit, if the voltage rises to 12V, because start insufficient voltage cannot afford to vibration, resulting in two simultaneous conduction mos tube so burned components. So the first will strat switching power supply voltage reaches 12V above and then access the induction heating circuit. This circuit cannot only do the induction heating, the copper tube into the high-frequency transformer, is a powerful inverter.

Induction stove works on the principle of electromagnetic induction by heating the vessels directly. The vessels must be in ferromagnetic material of which is capable of allowing the eddy currents to flow and produce heat on the material.

ii. Solar DC fan with inbuilt LED

This fan directly works on the battery without any external supply. The battery can be charged with the help of solar panels. The rating of the battery used is 12V, 7.2 Ah. The input voltage of the solar DC fan is 12V and current rating is 1.7 - 2 Amps and available in 12W – 15W. It has a inbuilt LED light without any oscillations. This fan is also provided with the USB cable port facility where mobiles can be charged in outdoor/outskirts canteen**.** It is ideal for general use in hotels, restaurants, shops, offices and home.

iii. BLDC ceiling fan

Ratings: 12V, 24 Watts.

BLDC Energy efficient ceiling fan of 24 watts v/s regular household fan of average 75 watts saves around Rs. 1500/- to 2200/- per year. It is provided with the reverse polarity protection and short circuit protection, DC speed control regulator with 3 speed option and on/off option. It is fitted with the double ball bearing and 100% copper wiring for lowest power consumption. Blades and other materials are 100% aluminium powered coated. It can be used with any 12 Volts battery or can be connect through 12 Volts solar panels(40 watts – 80 watts).

iv. Solar pedestal fan

Ratings: 12V, 42Watt

It can be operated with the help of solar, adapter and battery.

v. LED Bulbs

Rating: 12 V (5W, 7W, 10W, 12W & 15W), 48V (9W)

These bulbs consume very less power when compared to CFL and incandescent bulbs**.**

CHAPTER-5

CALCULATION OF DC-DC CONVERTER

This chapter presents the calculation for the selection of DC-DC Converter components (Inductor, Capacitor and Resistor) and their values.

5.1. Selection of Converter Components and their Values

Formulae for Boost Converter

- **Duty Cycle D = 1- (V_{in}/V_{out})**

Where: V_{out} is output voltage

V_{in} is input voltage

- **Selection of Inductor**

$L= (V_{in}.D/fs.\Delta I_L)$

Where: L is inductor

ΔI_L is Inductor ripple

$T = 1/f_s$ = Switching time

f_s is switching frequency

- **Selection of Capacitor**

$C = (I_o.D/f_s.\ \Delta V_c)$

Where : ΔV_c is change in output voltage

Calculation for Boost converter: Considering DC motor as a load

V_{in} = 12V, V_{out} = 24V, I_o = 1.25A, P_L= 250W, I_L= 10.41A

%D = 1 – (12/24) * 100 = 50 %

ΔI_L = 30% of IL

= 0.30 * 10.41

= 3.123A

Considering f_s = 695 hz

L = (12*0.50)/(695*3.123)

= 2.77 mH

ΔV_c = 2% of V_{out}

= 0.20 * 24

= 0.48V

C = (1.25*0.50)/(695*0.48)

= 1880 µF

R = (V_{out})^/P_L

= (24)^2/250

= 2.304 Ω

CHAPTER-6

ELECTRIC CART

This Chapter presents the description of cart and it's dimensions.

6.1. Dimensions of Electric Cart and it's features

Fig.6.1 Electric cart

Dimensions of the cart: 6 x 4 feet. This cart is developed for the mobile canteens. The cart runs electrically with the help of two DC motors of 24V, 250 watts. The motors are fixed to the back wheels. The carrying capacity of the cart is around 100kg. The supply to the motors is given by the solar panel while DC loads and DC motors are not operated simultaneously. Hence satisfies electricity the supply to the motors when loads are off.This is a SPV sheltered type cart which can be adopted by the street vendors with DC loads and DC distribution which is much effective during sunshine hours. These carts are economically affordable by the street vendors as it can be available within Rs. 15000/- to 20000/- with the less payback period.

CHAPTER-7

DC DISTRIBUTION SYSTEM

This Chapter presents the introduction to DC distribution system, Advantages of DC transmission, advantages of DC distribution system and wiring diagram for proposed system.

7.1. Introduction to DC Distribution System

A DC distribution system has many advantages over an AC distribution system. It offers higher efficiency and reliability at an improved power quality. It has reduced installation costs as it requires fewer power conversion stages, less copper, and smaller floor space. DC distribution enables simpler integration of renewable energy sources and energy storage systems. Since the power is distributed in DC, there is no reactive power or skin effect in the system. Unlike the AC distribution system, a DC distribution system facilitates plug and play features as it does not require any synchronization. Telecommunication systems and data centers are among the few surviving examples of DC distribution systems. They are low voltage ($48V_{dc}$) power systems that have characteristics similar to a conventional DC distribution system. The requirement of DC power for major consumer electronic loads and recent developments in renewable energy technology as well as increased penetration of distributed energy resources have prompted renewed interest in DC distribution systems among researchers and industry players.

Renewable energy sources together with DC microgrids have many advantages over conventional AC distribution system; in terms of cost, lesser conversion stages, efficiency and minimum complex operation. Recent developments and trends in the electric power consumption clearly indicate an increasing use of dc in end-user equipment. Computers, TVs, and other electronic-based apparatus use low-voltage dc obtained by means of a single-phase rectifier followed by a dc voltage regulator. By using dc for distribution systems, it would thus be possible to skip conversion stage in all these cases, with consequent savings and higher reliability due to a decreased number of components. Moreover, energy delivery at dc is characterized by lower losses and voltage drops in lines.

7.2. Advantages of DC Distribution and Transmission System

The DC transmission is the transmission of electric power when the direct current system is employed for the power transmission.

Advantages of DC Transmission

The high voltage DC transmission system has the following advantages −

- DC transmission requires less conductor material than AC transmission as only two wires are required for the power transmission through DC system.
- DC transmission lines are free from the skin effect. Therefore, the entire cross-section of the line conductor is utilizedhence the effect resistance of the line is small.
- There is no capacitance in the DC transmission. Therefore, there is no power loss due to the charging current.
- There is no inductance, phase displacement, and surge problems in the DC transmission.
- For the same sending end voltage and load conditions, the voltage drop in the DC transmission line is less than the AC transmission line. It is because of the absence of inductance in DC transmission line.
- A DC transmission line has better voltage regulation than an AC transmission line.
- For the same voltage, A DC transmission system requires less insulation material because the potential stress on the insulation is less in case of DC transmission system than that in AC transmission system.
- DC transmission does not suffer from stability and synchronizing problems.
- In high-voltage DC transmission there is no dielectric losses.
- A DC transmission line has less corona loss and reduced interference with the communication circuits.

Advantages of DC Distribution System

- A DC System has a **less potential stress over AC system for same Voltage level**. Therefore, a DC line requires less insulation.
- In DC System there is no interference with other communication lines and systems.
- In DC Line, Corona losses are very low as compared to the AC transmission lines.

7.3. Wiring Diagram of DC distribution system of proposed model

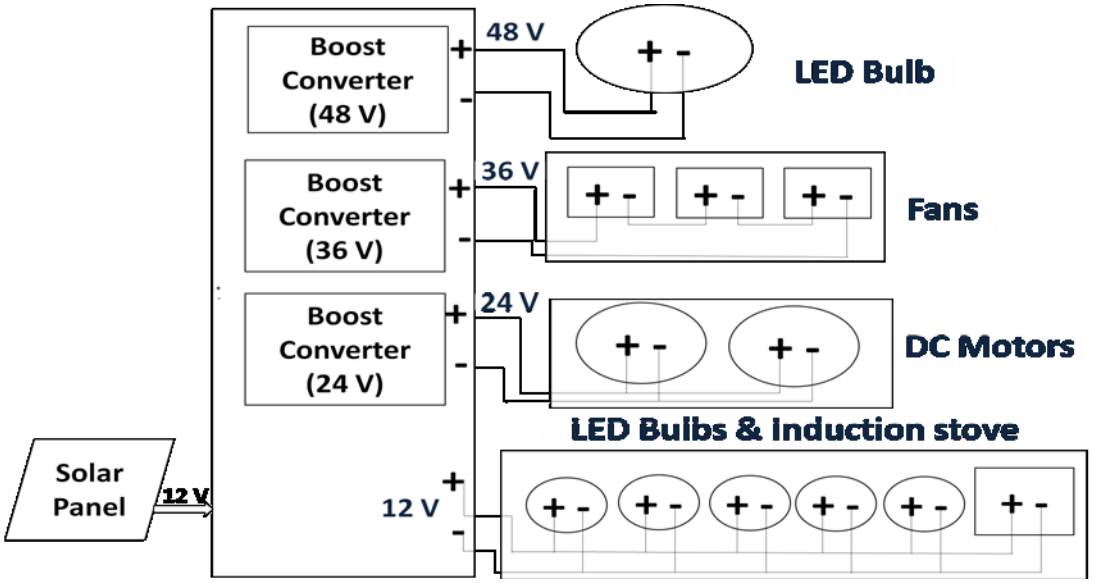

Fig.7.3. Wiring Diagram of Proposed model

Fig.7.3 shows the wiring diagram for proposed for mobile canteen. Here 12V otput from Solar panel is given to the 12V input of DC-DC Converter unit. As a result we get four output voltage levels such as 12V, 24V, 36V & 48V. Five 12V LED Bulbs connected in parallel with the solar induction stove and then connected to the 12V output of DC-DC converter. Two DC Motors of 24V connected in parallel is connected to the 24V output of DC-DC Converter. Three 12V Solar fans are connected in series are connected to the 36V output of DC-DC Converter. One 48V bulb is connected to the 48V output of DC-DC Converter.

CHAPTER-8

RESULTS

This Chapter presents the testing results of DC-DC Converter with different combination of DC Loads.

8.1. Testing of DC-DC Converter with DC Loads

Table 8.1 Testing Results of DC-DC Converter with different DC Loads

Sl.	Type of Load	Voltage (V)	Current (A)
1	Solar Pedestal fan	11.5	1.46
2	DC Motor	24	1.14
3	LED Bulb	47.9	0.15
4	Series connection of DC motor and fan	36.1	1.2
5	Series connection of two DC motors	47.9	1.25
6	Two DC motors connected in parallel with LED bulb	23.9	2.29

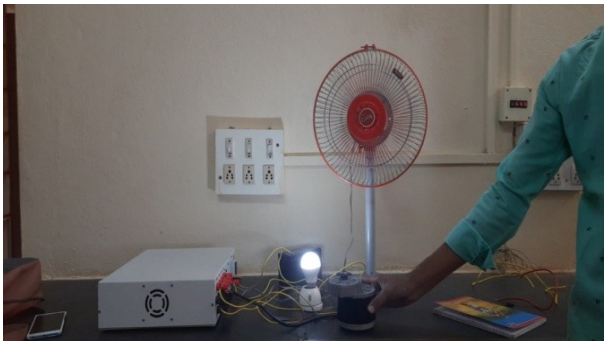

Fig 8.1

Fig 8.2

Fig 8.5

Fig 8.6

Fig 8.1, 8.2, 8.3 & 8.4 shows the testing of DC-DC Converter with different DC Loads

8.2. Testing Results of DC-DC Converter for proposed Wiring diagram

Table 8.2 Testing of DC-DC Converter with different combination of DC Loads

Sl.	Type of Load	Voltage (V)	Current (Amperes)	Speed (RPM)
1	DC Stove connected in parallel with LED bulbs	11.2	0.88	-
2	Two motors (24 V) and Bulb connected in parallel	24	1.14	
3	Three table fans connected in series	36.1	1.2	-
	Speed 1	8.6	0.74	503
	Speed 2	8.6	0.74	1049
4	LED Bulb	47.9	0.15m	-

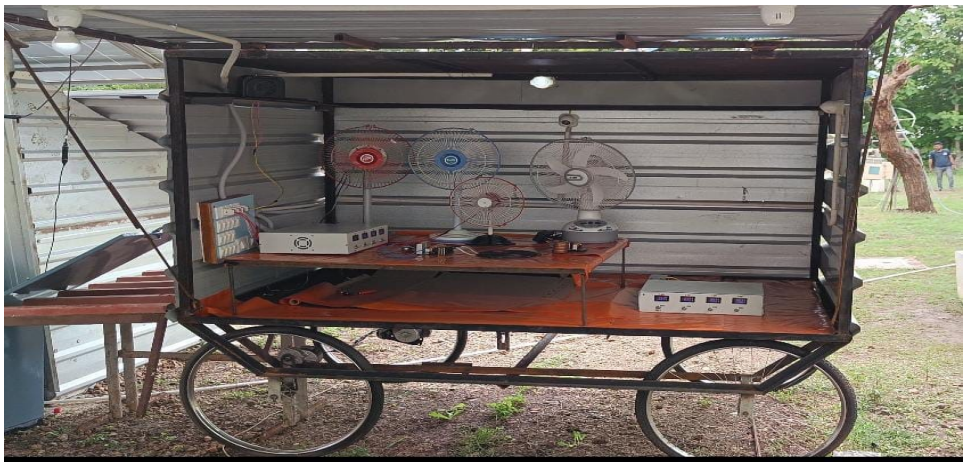

Fig 8.5 wiring connection of proposed model

Fig 8.6 Testing results of connected proposed model

CHAPTER-9

CONCLUSION AND FUTURE SCOPE

This Chapter presents the Conclusion and the future scope.

9.1. Conclusion

Demonstration of the shelter type SPV powered mobile canteen with DC distribution is successfully carried out. Testing of DC-DC converter with different loads was conducted by supplying power from the solar panels. Thus, it resolves the electricity issue for the street vendors for the mobile canteen who are isolated from the grid power connection. It also proves that conventional AC system can be replaced by the DC system that has advantages in terms of cost, performance reliability, stability and efficiency. Therefore, the proposed SPV mobile canteen results in sustainable solution for small scale DC distribution systems for domestic and commercial applications and the proposed idea of SPV shelter powered DC energy systems can be extended for the domestic household applications and stand telecom towers etc.

9.2. Future scope

- The proposed DC-DC Converter can be operated upto 72V and 63A.
- The proposed system can be effectively implemented for the outdoor loads such as small scale hotels, remotely located homes etc.

Economic Feasibility

SI	Components	Specification	Quantity	Cost in Rs
1	Solar Induction Stove	12-48V, 1000W	2	20,000
2	Solar fan with inbuilt LED	12V, 15W	1	3,150
3	Solar Pedestal fan	48V, 42W	1	4,000
4	LED Bulbs	12V (5W, 7W, 9W, 12W& 15W)	10(2 each)	1,311
	LED Bulb	48V, 9W	1	280
5	Axial Cooling Ventilation fan	12V, 40W	1	425
6	DC Motor 1	24V, 250W, 3000 RPM	2	9000
	DC Motor 2	24V, 250W, 2650W		
7	DC-DC Converter	12V, 24V, 36V 48V V_{Max}= 72V	2	70,000
8	Electric Cart	With 2 DC Motors	1	19,000
9	Miscellaneous materials	-	-	5000
Total				1,32,166

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Industrial Internship Report on

INTERNET OF THINGS

Undergone at

PIE INFOCOMM

Submitted in partial fulfilment of the requirements for the award of degree of

Bachelor of Engineering

in

Electrical and Electronics Engineering

Submitted by

A Shreya

2BA18EE001

Basaveshwar Engineering College (Autonomous)

[AICTE Recognized, TEQIP-I,II&III, Permanently Affiliated to VTU Belagavi, NBA & NAAC Accredited]

Bagalkot-587103, Karnataka state, India

Department of Electrical & Electronics Engineering

[Govt. Aided, Accredited by NBA 2003, 2006, 2018, Recognized R&D centre of VTU]

Basaveshwar
Engineering
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Bagalkot-587103, Karnataka

BVVS

Department of Electrical and Electronics Engineering

Certificate

This is to certify that the Internship titled " **Internet of Things** *"* is carried out by ***Miss.*** **A Shreya** **(USN: 2BA18EE001)** at **PIE INFOCOMM**.

This report satisfies the academic requirements with reference to Internship work prescribed for VII semester for the award of Bachelor of Engineering degree in Electrical and Electronics.

Dr. Basangouda F. Ronad
Internship Coordinator

Basaveshwar Engineering College (Autonomous), Bagalkot

Department of Electrical and Electronics Engineering

Outcome Based Learning

	Programme Outcome	Mention the Academic activity that assisted while undergoing the internship	Mention the Internship Segments/ Activity
PO 1	Engineering knowledge	IEEE and technical papers Youtube Sources	Introduction part of internship
PO 2	Problem analysis	Mini Project (UEE665P)	Discussion with mentor
PO 3	Design/development of solutions	Mini Project (UEE665P)	Discussion with mentor Youtube sources
PO 4	Conduct investigations of complex problems	Mini Project (UEE665P)	Discussion with mentor
PO 5	Modern tool usage	Network Analysis Laboratory (UEE357L)	Proteus Software
PO 6	The engineer and society	Constitution of India (UHS126M)	Developing technical skills
PO 7	Environment and sustainability	Environmental Studies (UBT233M)	Organization Environment
PO 8	Ethics	Management and Entrepreneurship (UEE653H)	Discussion with mentor
PO 9	Individual and teamwork	Mini Project (UEE665P)	Weekly assignments
PO 10	Communication	Soft Skills (UHS001N)	Communication with mentor
PO 11	Project management and finance	Management and Entrepreneurship (UEE653H)	By using
PO 12	Life-long learning	Mini Project (UEE665P) Project Phase-1(UEE765P)	Outcomes of internship

A Shreya

Serial No : PI/20/2035

PIE π INFOCOMM

ISO CERTIFIED Registration no. UPSA28727715

CERTIFICATE OF COMPLETION

This Internship certificate for brilliant and consistent high standards of workmanship signed this day by the duly authorized officers is proudly presented to

Ms. A SHREYA

For her successful completion of Internship in

INTERNET OF THINGS

under Pie Infocomm Private Limited from 4th JUNE 2021 to 14th JULY 2021. It led to the Completion of project titled as "VOICE CONTROLLED HOME AUTMATION USING ARDUINO"

Vijay Kumar Jaiswal
(Director)

B. V. V. Sangha's

Basaveshwar Engineering College (A), Bagalkot

Department of Electrical and Electronics Engineering

Internship - Continuous Internal Evaluation by Industry Representative

1.Internship Details

Internee/Student Name	:	**A Shreya**
University Serial Number (USN)	:	**2BA18EE001**
Name of the Company/Industry	:	**PIE INFOCOMM**
Address of the Company	:	**1st floor, B-12, Sector E, Aliganj, Lucknow, Uttar Pradesh**
Topic/Domain/Title of the internship	:	**Internet of Things**
Mode of Internship	:	**Online**
Date of Commencement	:	**04-06-2021**
Date of Completion	:	**14-07-2021**
Duration in number of weeks	:	**5 Weeks**
Number of Training Days	:	**40 Days**
Number of Days Intern/Student attended the Training	:	**40 Days**

External Guide	Details	
	Name	: Ms. Aishwarya Saxena
	Designation	: Sr. Software Developer
	Email-id	: hr@pieinfocomm.in
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2.Evaluation by External Guide

Internship CIE Marks		
Evaluation Criteria	**Maximum Marks**	**Marks awarded**
Quality of Work	10	9
Ability to Learn	10	9
Initiative and Creativity	10	8
Character Traits	10	10
Dependability	10	9
Organizational Fit	10	8
Response to Supervision	10	9
Total Marks	70	62

External Guide Signature

Date: 08-02-2022

Acknowledgement

This internship would not been possible without the guidance and help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this internship.

First, I would like to thank Vijay Kumar Jaiswal, Director of PIE INFOCOMM for giving me the opportunity to do an internship within the organization.

I am highly indebted to Principal Dr S. S. Injaganeri, for the facilities provided to accomplish this internship.

I would like to thank Head of the Department of EEE, Dr. Suresh H Jangamshetti, for his constructive criticism throughout my internship.

I would like to thank Dr. B. F. Ronad, internship coordinator department of EEE for their support and advices to get and complete the internship.

I am extremely great full to my department staff members and friends who helped me for successful completion of this internship.

-A Shreya

Abstract

The Internet of Things (IOT) describes a kind of network which interconnects various devices with the help of internet. IOT assists to transmit data with among devices, tracing and monitoring devices and other things. IOT make objects 'smart' by allowing them to transmit data and automating of tasks, without lack of any physical interference. A health tracking wearable device is an example of simple effortless IOT in our life. A smart city with sensors covering all its regions using diverse tangible gadgets and objects all over the community and connected with the help of internet. This word IOT was first suggested by Kevin Ashton in 1999. The subsequent segment represents fundamental of IOT. It hands out several covering pre-owned in IOT and varied fundamental denominations connected. It is primarily enlargement of helping-hand using Internet. When the household devices are connected with the help of internet, this can help to automate homes, offices or other units using IOT. IOT is being used during COVID-19 pandemic for contact tracing.

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Chapter 1

Introduction

1.1 Introduction to Internet of Things

The Internet of things (IoT) is an ecosystem of connected physical devices/objects that are accessible through the internet. IoT is a system of interrelated devices, digital products, objects, people or animals that are provided with unique identifiers (UIDs). It has the ability to transfer data over a network without requiring any human interaction.

IoT is big and real in terms of everything. However, technologies and standards are still evolving. It's expecting to change more in the coming years. IoT will connect 4 billion people on the planet through multiple devices and applications. By connecting "things", IoT will make our lives easier. The new wave of connectivity is going beyond smartphones and laptops by thriving towards connected cars, smart homes, wearable's, health care, smart cities, and many more. IoT helps these devices to bridge the gap between physical and digital worlds to improve the quality and productivity of industries, society and life. Here we have given a graph that represents the number of devices in the internet of things in the past 5 years.

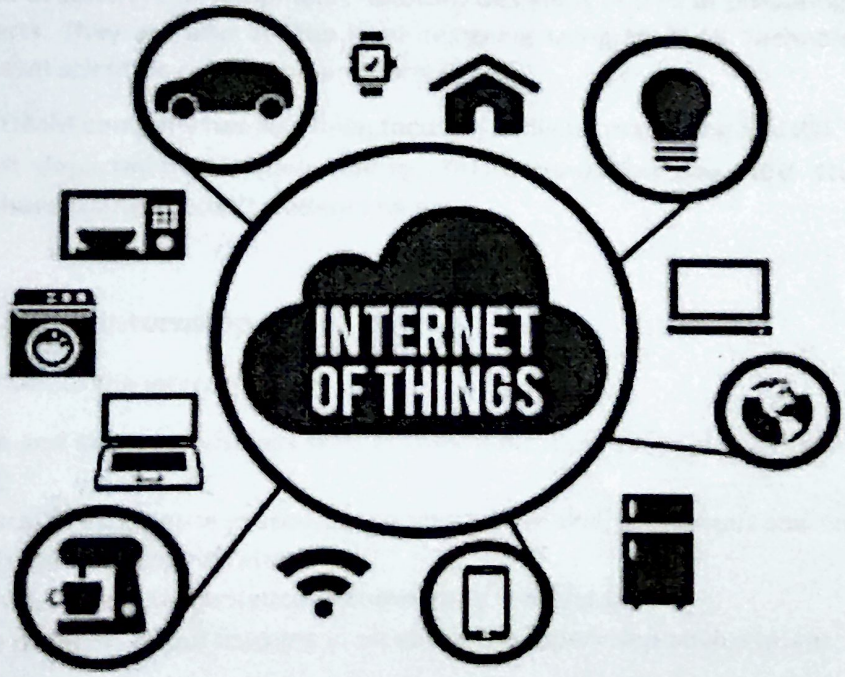

Fig.1: Internet of Things

1.2 About the Organization

PIE INFOCOMM PRIVATE LIMITED

PIE π INFOCOMM

RESEARCH, TRAINING AND DEVELOPMENT

Fig.2: Logo of PIE INFOCOMM Company

PIE INFOCOMM PVT. LTD. Is a non-government company and is a Registered Software Company that has been providing specialized IT services and business solutions since 2002 to make the business operations easier. This company's motto is "Generating Ideas" and this company implement it to their clients best in field of software development, AutoCAD Designing as well as preparing blueprints of motors and the spare parts. They are also in Chip level designing using MATLAB Technology. They have been developing high level scientific calculation program.

PIE INFOCOMM company has also been focusing in digital marketing and IOT Technology. They are having one sublet department of share trading. This organization was had started as a training organization and have trained 25,000 students till now.

1.3 Objectives of the Internship

The objectives of the internship are:

- To develop and improve business skills in communication, technology, quantitative reasoning and teamwork.
- To gain practical experience in applying administrative skill, techniques and theory through working with a professional administrator.
- To gain problem-based experience in community leadership.
- To practice problem-based learning in an authentic supervised environment.

1.4 Internship Schedule

	NAME OF THE TOPIC/MODULE COMPLETED
1st WEEK	Overview to Company & Total Internship Schedule
	Brief Introduction on Internet of Things (IOT)
	Discuss PROS & CROS of IOT
	Basics of Electronics
	Learning about sensors

	NAME OF THE TOPIC/MODULE COMPLETED
2nd WEEK	Learning about embedded systems
	Introduction to Proteus software
	Programming for Arduino, Node MCU
	Learn how to connect circuits
	Sample Projects

	NAME OF THE TOPIC/MODULE COMPLETED
3rd WEEK	Introduction to Blynk application
	Configuring Blynk app with Wi-Fi
	Sample Project using Blynk app
	Introduction to Raspberry Pi
	Discuss about the latest IOT projects
	Discussion on left over Topics

	NAME OF THE TOPIC/MODULE COMPLETED
4th, 5th, WEEK	Assigning Projects
	Implementation of Project
	Project Presentation
	Submission of project report

Chapter 2

Week wise Activity Reports

2.1 Week 1

2.1.1 History

The Internet of Things (IoT) has not been around that long. It was only in 1999 that the term 'internet of things' was coined by Kevin Ashton. Ashton used the phrase as the title of his presentation for a new sensor project he was working on and it stuck from there.

While the phrase came about in 1999, the concept of connected devices dates back to 1832. When the first electromagnetic telegraph was designed, allowing direct communication between two machines through the transfer of electrical signals. However, the true Internet of Things history began with the invention of the Internet in the late 1960s.

The world's first IoT device was invented in the early 1980s at the Carnegie Melon University. A group of students from the university created a way to get their campus Coca-Cola vending machine to report on its contents through a network in order to save them the trek if the machine was out of Coke. They installed micro-switches into the machine to report on how many Coke cans were available and if they were cold.

In 1990, John Romkey connected a toaster to the internet for the first time. A year later, a group of students at the University of Cambridge used a web camera to report on coffee. They came up with the idea to use the first web camera prototype to monitor the amount of coffee available in their computer labs coffee pot. They did this by programming the web camera to take photos three times a minute of the coffee pot. The photos were then sent to local computers so everyone could see if there was coffee available.

The Internet of Things was a common topic used by the media at the beginning of the 21st Century with several major developments paving the way for the future of IoT. LG Electronics introduced the world's first refrigerator connected to the internet in 2000. Allowing consumers to do their food shopping online and make video calls. This invention was followed by a small rabbit-shaped robot in 2005 that could report the latest news, weather forecasts and stock market changes. While the first International Conference on Internet of Things was held in 2008 in Switzerland.

Today there are more than 27 billion devices connected to the Internet of Things, with experts expecting this number to rise to over 100 billion devices by 2030.

2.1.2 Definition

"Today computers and the Internet are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (1 petabyte=1015 bytes) of data available on the Internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture, or scanning a bar code. Conventional diagrams of the Internet leave out the most numerous and important routers of all - people.The problem is, people have limited time, attention and accuracy all of which means they are not very good at capturing data about things in the real world. And that's a big deal. We're physical, and so is our environment ... You can't eat bits, burn them to stay warm orput them in your gas tank. Ideas and information are important, but things matter much more. Yet today's information technology is so dependent on data originated by people thatour computers know more about ideas than things. If we had computers that kneweverything there was to know about things using data, they gathered without any help fromus we would be able to track and count everything, and greatly reduce waste, loss and cost.We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. The Internet of Things has the potential to change the world,just as the Internet did or even more.

2.1.3 Architecture of Internet of Things

Architecture of internet Of Things contains basically 4 layers:

- Application Layer
- Gateway and the network layer
- Management Service layer
- Sensor layer

Application Layer:

- Lowest Abstraction Layer.
- With sensors we are creating digital nervous system.
- Incorporated to measure physical quantities.
- Interconnects the physical and digital world.
- Collects and process the real time information.

Gateway and the Network Layer:

- Robust and High-performance network infrastructure.
- Supports the communication requirements for latency, bandwidth or security.
- Allows multiple organizations to share and use the same network independently.

Management Layer:

- Capturing of periodic sensory data.
- Data Analytics (Extracts relevant information from massive amount of raw data).
- Streaming Analytics (Process real time data).
- Ensures security and privacy of data.

Sensor Layer:

- Provides a user interface for using IoT.
- Different applications for various sectors like Transportation, Healthcare, Agriculture, Supply chains, Government, Retail etc.

2.1.4 Applications

There are several application domains which will be impacted by the emerging Internet of Things. The applications can be classified based on the type of network availability, coverage, scale, heterogeneity, repeatability, user involvement and impact.

Categorization of the applications into four application domains:

- Personal and Home
- Enterprise
- Utilities
- Mobile

There is a huge crossover in applications and the use of data between domains. For instance, the Personal and Home IoT produces electricity usage data in the house and makes it available to the electricity (utility) company which can in turn optimize the supply and demand in the Utility IoT. The internet enables sharing of data between different service providers in a seamless manner creating multiple business opportunities.

2.1.5 Pros and Cons of IOT

The Internet of Things (IoT) refers to the internetworking of computing devices, machines, objects and more, that are embedded with unique identifiers and have the ability to transfer data over a network. The vast amount of intelligence and services brought to the table, have the potential to significantly shape our everyday lives – how we manage our cities, healthcare and even how we grow our food. To date, there are over 20 billion things connected to the internet, with that number expected to jump to 50 billion by 2020. Surprisingly, many people use IoT every day without even knowing it. Connected thermostats, ATM machines, wearables and even traffic lights all make up the IoT. Below we discuss the pros and cons of the IoT and how it could change your everyday life, very soon.

PROs:

- Automation: Automation leads to uniformity in tasks, quality of service and control of day-to-day tasks without human intervention. Machine-to-machine communication also helps maintain transparency throughout the process.
- Efficiency: Machine-to-machine interaction provides for better efficiency, enabling people to focus on other jobs.
- Cost Savings: In addition to the optimal utilization of energy and resources, the IoT helps alleviate the problems associated with bottlenecks, breakdowns and system damages.
- Communication: IoT allows physical devices to stay connected and better communicate, which creates greater quality control.
- Instant Data Access: More available information helps simplify the decision making process, making life easier to manage.

CONs:

- Privacy and Security: As many of our everyday appliances, machines and services become connected to the internet, much more information is readily available. It makes it harder to keep confidential information out of the hands of hackers and other unauthorized users.
- Compatibility: Currently, there is not international standard of compatibility for the IoT which can make it hard for devices from different manufacturers to communicate with each other.
- Complexity: Because the IoT is such a vast, diverse network, a single failure in either the software or hardware can have disastrous consequences.

- Less Jobs: As IoT brings in more consistent automation, we could see a decline in the need for unskilled employees in the workplace.
- Technologically Dependent Life: As our lives become more and more dependent on technology, basic human interaction skills will be reduced across society.

The IoT has already become a huge part of everyday life, without many of us even realizing it. As technology continues to grow and develop, so too will the use of IoT for many of our basic interactions. It is up to us to decide how much of our daily lives are we willing to be controlled by technology. If done correctly though, it will automatically adapt to our needs and benefit society as a whole.

2.1.6 Components

Arduino: Arduino is an open source, PC paraphernalia and programming organization, endeavor, and client group that plans and produce microcontroller packs for constructing programmed devices and intelligent object that can detect and controlquestions in the real world. The inception of the Arduino extends began at the Interaction Design Institute in Ivrea, Italy. The equipment reference plans are appropriated under a Creative Commons Attribution Share.

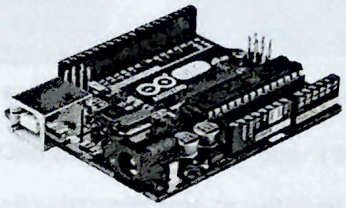

Fig.3: Arduino

ESP8266 (Wi-Fi Module): The ESP8266 is an ease Wi-Fi chip with full TCP/IP stack and MCU (Micro Controller Unit) capacity created by Chinese. These are the primary arrangement of modules made with the ESP8266 by the outsider producer AI-Thinker and remain the most generally available. They are large alluded to as "ESP-xx modules". To shape a workable advancement framework they require extra parts, particularly a serial TTL-to-USB connector and an outside 3.3-volt control supply.

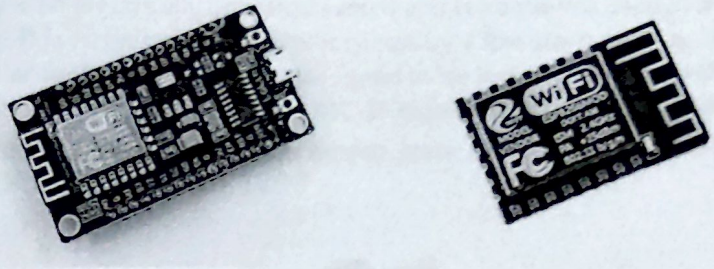

Fig.4: Wi-Fi Modules

Bread board and Jump wires: A breadboard is utilized to build and test circuits expeditiously afore finalizing anycircuit design. The breadboard has many apertures into which route components like ICs and resistors can be connected. The apertures are generally spaced 0.1 apart to put up standard DIP machinery. A typical breadboard that includes top and bottom power distribution rails. Jump wires are generally used to establish connectivity with bread board.

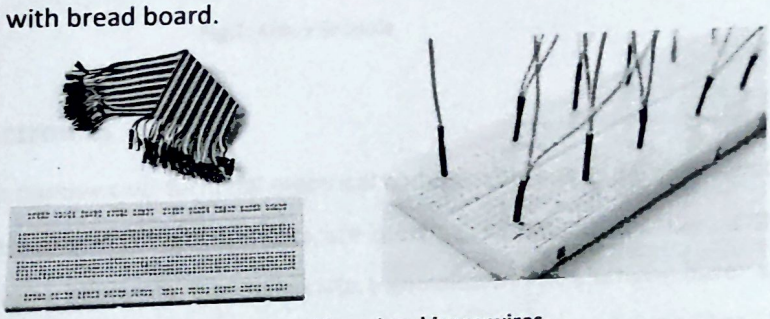

Fig.5: Bread board and jump wires

Power Supply Board: Modern Arduino Uno boards allow the board to have more than one source of power to be connected simultaneously. An intelligent switching circuitry ensures that the highest available voltage is selected and sent to the onboard voltage regulator and eventually powers up the board.

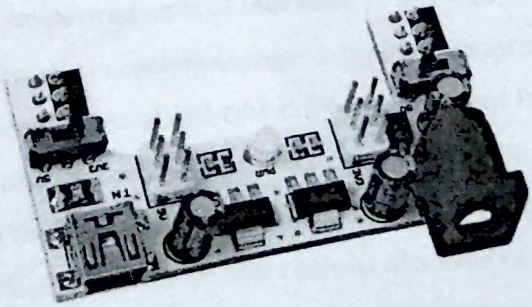

Fig.6: Power supply board

Channel Relay: A relay is an electrically operated switch and is frequently used in automatic controlcircuit. Relays are used where it is necessary to control a circuit by a low-power signal. Relays protect electrical circuits from overload or faults. This module is designed to be integrated with 2 relays that it is capable of control 2 relays. The relay shield use one QIANJI JQC-3F high-quality relay with rated load 7A/240VAC,10A/125VAC,10A/28VDC.The relay output state is individually indicated by a light-emitting diode.

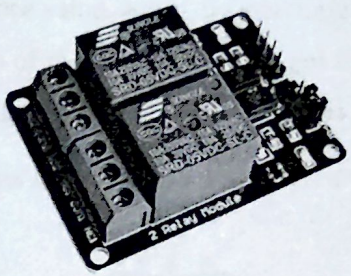

Fig.7: Relay Module

2.1.7 Basics of Electronics

Resistor: A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. The behaviour of an ideal resistor is dictated by the relationship specified by Ohm's law. As per Ohm's law voltage V= I*R. For example, if a 300-ohm resistor is attached across the terminals of a 12-volt battery, then a current flow is 12 / 300 = 0.04 amperes. The ohm (symbol: Ω) is the SI unit of electrical resistance, named after Georg Simon Ohm. An ohm is equivalent to a volt per ampere. Since resistors are specified and manufactured over a very large range of values, the derived units of milli Ohm (1 mΩ = 10−3 Ω), kilo Ohm (1 kΩ = 103 Ω), and mega Ohm (1 MΩ = 106 Ω) are also in common usage. 2 Types of Resistors: Basically, there are two types of resistors in which the different types of resistors can be fitted. Fixed Resistor: Fixed resistors are by far the most widely used type of resistor used in electronics circuits to set the right conditions in a circuit. Their values are determined during the design phase of the circuit, and they should never need to be changed to "adjust" the circuit. Variable Resistor: These resistors consist of a fixed resistor element and a slider which taps onto the main resistor element. This gives three connections to the component: two connected to the fixed element, and the third is the slider. In this way the component acts as a variable potential divider if all three connections are used. Resistor Colour Code: Bigger resistors have their values mentioned on it but for small resistors coloured painted bands are used to indicate both their resistive value and their tolerance

with the physical size of the resistor indicating its wattage rating. These coloured painted bands produce a system of identification generally known as a Resistors Colour Code. The resistor colour code markings are always read one band at a time starting from the left to the right, with the larger width tolerance band oriented to the right side indicating its tolerance. By matching the colour of the first band with its associated number in the digit column of the colour chart in upcoming slide the first digit is identified and this represents the first digit of the resistance value. Again, by matching the colour of the second band with its associated number in the digit column of the colour chart we get the second digit of the resistance value and so on. Then the resistor colour code is read from left to right as illustrated in image below.

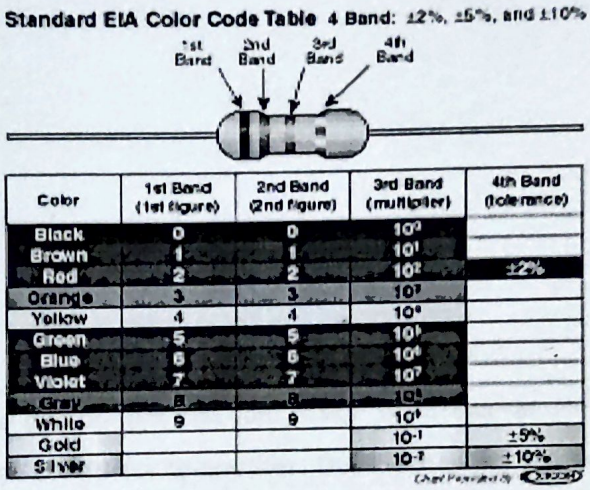

Fig.8: The standard resistor colour code

Capacitor: The capacitor is a component which has the ability or "capacity" to store energy in the form of an electrical charge producing a potential difference (Static Voltage) across its plates, much like a small rechargeable battery. A capacitor consists of two or more parallel conductive (metal) plates which are not connected or touching each other, but are electrically separated either by air or by some form of a good insulating material, called the Dielectric. The unit of Capacitance is Farad. Due to this insulating layer, DC current cannot flow through the capacitor as it blocks it allowing instead a voltage to be present across the plates in the form of an electrical charge. When used in a DC circuit, a capacitor charges up to its supply voltage but blocks the flow of current through it because the dielectric of a capacitor is non-conductive and basically an insulator. When a capacitor is connected to an AC circuit, the flow of the current appears to pass straight through the capacitor with little or no resistance.

Capacitance is the electrical property of a capacitor and is the measure of a capacitors ability to store an electrical charge onto its two plates with the unit of capacitance being the Farad (abbreviated to F) named

after the British physicist Michael Faraday. Capacitance is defined as being that a capacitor has the capacitance of One Farad when a charge of One Coulomb is stored on the plates by a voltage of One volt. Capacitance, C is always positive and has no negative units. However, the Farad is a very large unit of measurement to use on its own so sub-multiples of the Farad are generally used such as micro-farads, nano-farads and pico-farads.

Types of Capacitors: There are very large variety of different types of capacitors and each one has its own set of characteristics and applications. here are a few of the "common" types of capacitors available.

- Ceramic Capacitors
- Film Capacitors
- Electrolytic Capacitors
- Super Capacitors
- Variable Capacitors
- Dielectric Capacitor

Switch: A switch is an electrical component that can "make" or "break" an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch removes or restores the conducting path in a circuit when it is operated. The simplest type of switch is one where two electrical conductors are brought in contact with each other by the motion of an actuating mechanism.

2.2 Week 2

2.2.1 Introduction to Embedded systems

An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations.

Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed.

Embedded system applications range from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems.

2.2.2 Basic structure of Embedded System

The basic structure of an embedded system includes the following components:

Sensor: The sensor measures and converts the physical quantity to an electrical signal, which can then be read by an embedded systems engineer or any electronic instrument. A sensor stores the measured quantity to the memory.

A-D Converter: An analog-to-digital converter converts the analog signal sent by the sensor into a digital signal.

Processor & ASICs: Processors assess the data to measure the output and store it to the memory.

D-A Converter: A digital-to-analog converter changes the digital data fed by the processor to analog data

Actuator: An actuator compares the output given by the D-A Converter to the actual output stored and stores the approved output.

2.2.3 Future trends in Embedded Systems

The industry for embedded systems is expected to continue growing rapidly, driven by the continued development of Artificial Intelligence (AI), Virtual Reality (VR) and Augmented Reality (AR), machine learning, deep learning, and the Internet of Things (IoT). The cognitive embedded system will be

at the heart of such trends as: reduced energy consumption, improved security for embedded devices, cloud connectivity and mesh networking, deep learning applications, and visualization tools with real time data.

According to a 2018 report published by QY Research, the global market for the embedded systems industry was valued at $68.9 billion in 2017 and is expected to rise to $105.7 billion by the end of 2025.

2.2.4 Introduction to Proteus Design Suite

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB (Printed Circuit Board) layout design. It can be purchased in many configurations, depending on the size of designs being produced and the requirements for microcontroller simulation. All PCB Design products include an auto router and basic mixed mode SPICE simulation capabilities.

Schematic Capture

Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations.

Microcontroller Simulation

The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables its use in a broad spectrum of project prototyping in areas such as motor control, temperature control and user interface design. It also finds use in the general hobbyist community and, since no hardware is required, is convenient to use as a training or teaching tool. Support is available for co-simulation of:

Microchip Technologies PIC10, PIC12, PIC16, PIC18, PIC24, dsPIC33 microcontrollers

Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 microcontrollers

NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 microcontrollers

Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 microcontrollers

Parallax Basic Stamp, Freescale HC11, 8086 microcontrollers

PCB Design

The PCB Layout module is automatically given connectivity information in the form of a netlist from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.

3D Verification

The 3D Viewer module allows the board under development to be viewed in 3D together with a semi-transparent height plane that represents the boards enclosure. STEP output can then be used to transfer to mechanical CAD software such as Solid works or Autodesk for accurate mounting and positioning of the board.

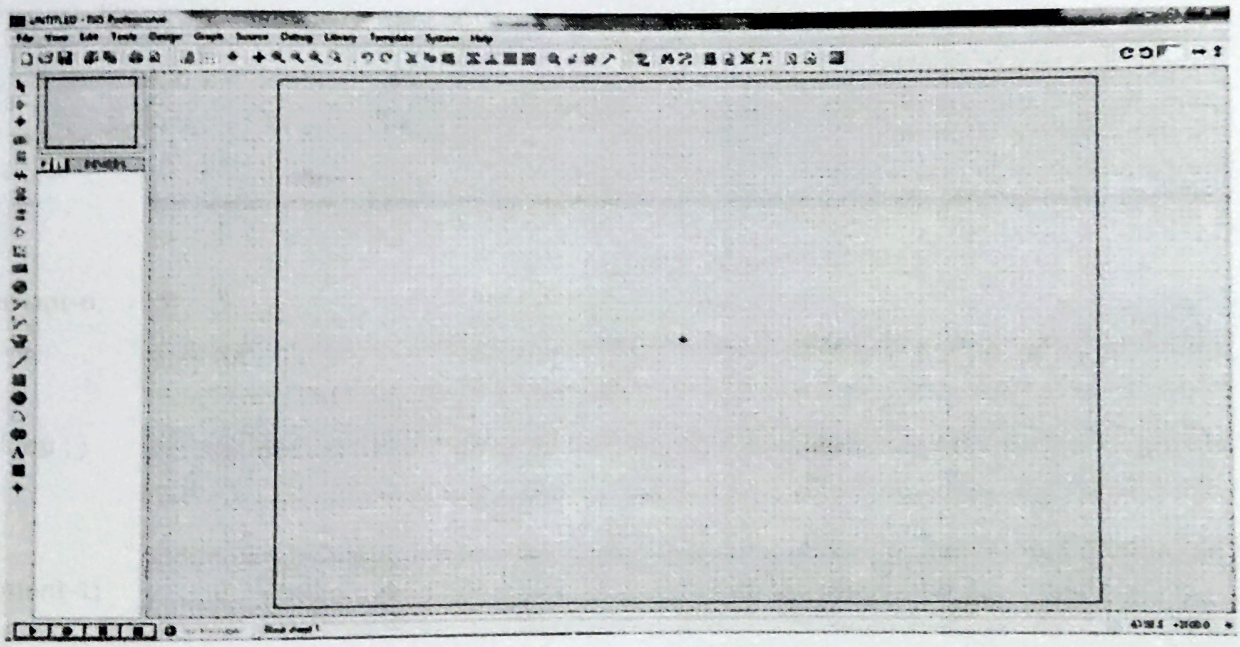

Fig.9: Structure of Proteus Design Suite

2.2.5 Programming for Arduino

Arduino programs are written in the Arduino Integrated Development Environment (IDE). Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program

in Arduino language) for different Arduino boards. The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language. After the sketch is written in the Arduino IDE, it should be uploaded on the Arduino board for execution.

The first step in programming the Arduino board is downloading and installing the Arduino IDE. The open-source Arduino IDE runs on Windows, Mac OS X, and Linux.

Basics of Arduino programming:

The structure of Arduino program is pretty simple. Arduino programs have a minimum of 2 blocks,

Preparation & Execution

Each block has a set of statements enclosed in curly braces:

```
void setup( )
{
statements-1;
.
.
.
statement-n;
}
void loop ( )
{
statement-1;
.
.
.
statement-n;
```

}

Here, setup ( ) is the preparation block and loop ( ) is an execution block.

The setup function is the first to execute when the program is executed, and this function is called only once. The setup function is used to initialize the pin modes and start serial communication. This function has to be included even if there are no statements to execute.

```
void setup ( )

{

pinMode (pin-number, OUTPUT); // set the 'pin-number' as output

pinMode (pin-number, INPUT); // set the 'pin-number' as output

}
```

After the setup ( ) function is executed, the execution block runs next. The execution block hosts statements like reading inputs, triggering outputs, checking conditions etc..

In the above example loop ( ) function is a part of execution block. As the name suggests, the loop( ) function executes the set of statements (enclosed in curly braces) repeatedly.

```
Void loop ( )

{

digitalWrite (pin-number,HIGH); // turns ON the component connected to 'pin-number'

delay (1000); // wait for 1 sec

digitalWrite (pin-number, LOW); // turns OFF the component connected to 'pin-number'

delay (1000); //wait for 1sec

}
```

Arduino always measures the time duration in millisecond. Therefore, whenever the delay should be kept in milli seconds.

2.2.6 Connection of circuits

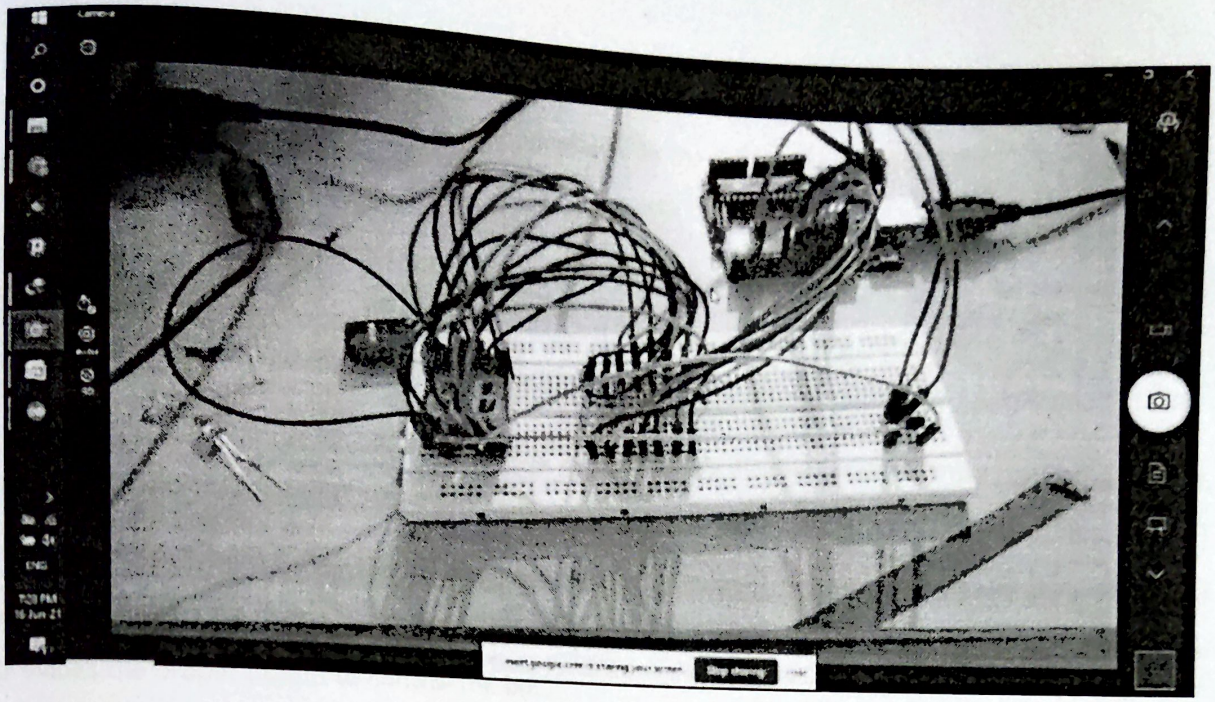

Fig.10: Connection of circuits in real implementation

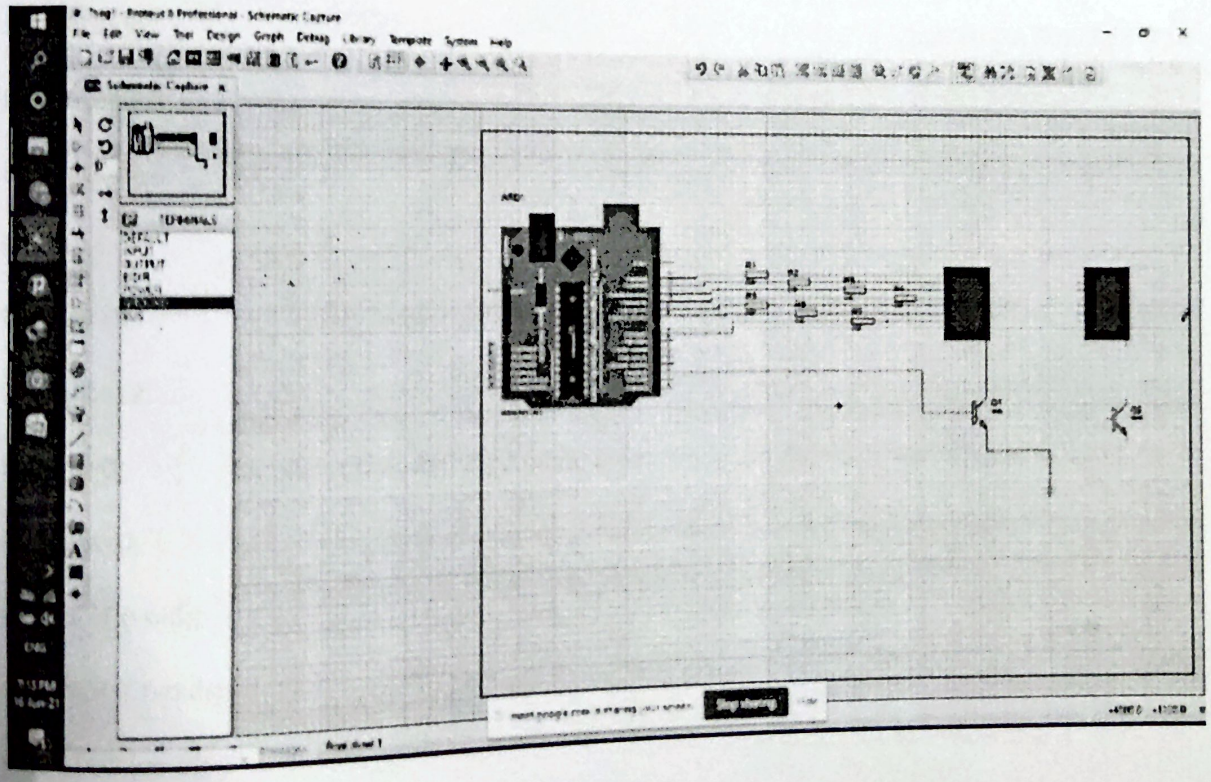

Fig.11: Connection of circuits in proteus design suite

2.2.7 Sample Projects

Project: Line following Robot using Arduino

The concept of the line follower robot is related to light. Here, we use the behaviour of light on the black and white surface. The white colour reflects all the light that falls on it, whereas the black colour absorbs the light.

In this line follower robot, we use IR transmitters and receivers (photodiodes). They are used to send and receive the lights. When IR rays fall on a white surface, it is reflected towards IR receiver, generating some voltage changes.

When IR rays fall on a black surface, it is absorbed by the black surface, and no rays are reflected; thus, the IR receiver doesn't receive any rays.

In this project, when the IR sensor senses a white surface, an Arduino gets 1 (HIGH) as input, and when it senses a black line, an Arduino gets 0 (LOW) as input. Based on these inputs, an Arduino Uno provides the proper output to control the bot.

Program code is as follows:

```
int mot1=9;
int mot2=6;
int mot3=5;
int mot4=3;
int left=13;
int right=12;
int Left=0;
int Right=0;
void LEFT (void);
void RIGHT (void);
void STOP (void);
void setup()
{
```

```
 pinMode(mot1,OUTPUT);
 pinMode(mot2,OUTPUT);
 pinMode(mot3,OUTPUT);
 pinMode(mot4,OUTPUT);
 pinMode(left,INPUT);
 pinMode(right,INPUT);
 digitalWrite(left,HIGH);
 digitalWrite(right,HIGH);
 }
 void loop()
 {
 analogWrite(mot1,255);
 analogWrite(mot2,0);
 analogWrite(mot3,255);
 analogWrite(mot4,0);
 while(1)
 {
  Left=digitalRead(left);
  Right=digitalRead(right);
if((Left==0 && Right==1)==1)
LEFT();
else if((Right==0 && Left==1)==1)
RIGHT();
}
}
```

```
void LEFT (void)
{
analogWrite(mot3,0);
analogWrite(mot4,30);
while(Left==0)
{
Left=digitalRead(left);
Right=digitalRead(right);
if(Right==0)
{
int lprev=Left;
int rprev=Right;
STOP();
while(((lprev==Left)&&(rprev==Right))==1)
{
Left=digitalRead(left);
Right=digitalRead(right);
}
}
analogWrite(mot1,255);
analogWrite(mot2,0);
}
analogWrite(mot3,255);
analogWrite(mot4,0);
}
```

```
void RIGHT (void)
{
analogWrite(mot1,0);
analogWrite(mot2,30);
while(Right==0)
{
Left=digitalRead(left);
Right=digitalRead(right);
if(Left==0)
{
int lprev=Left;
int rprev=Right;
STOP();
while(((lprev==Left)&&(rprev==Right))==1)
{
Left=digitalRead(left);
Right=digitalRead(right);
}
}
analogWrite(mot3,255);
analogWrite(mot4,0);
}
analogWrite(mot1,255);
analogWrite(mot2,0)
}
```

```
void STOP (void)
{
analogWrite(mot1,0);
analogWrite(mot2,0);
analogWrite(mot3,0);
analogWrite(mot4,0);
}
```

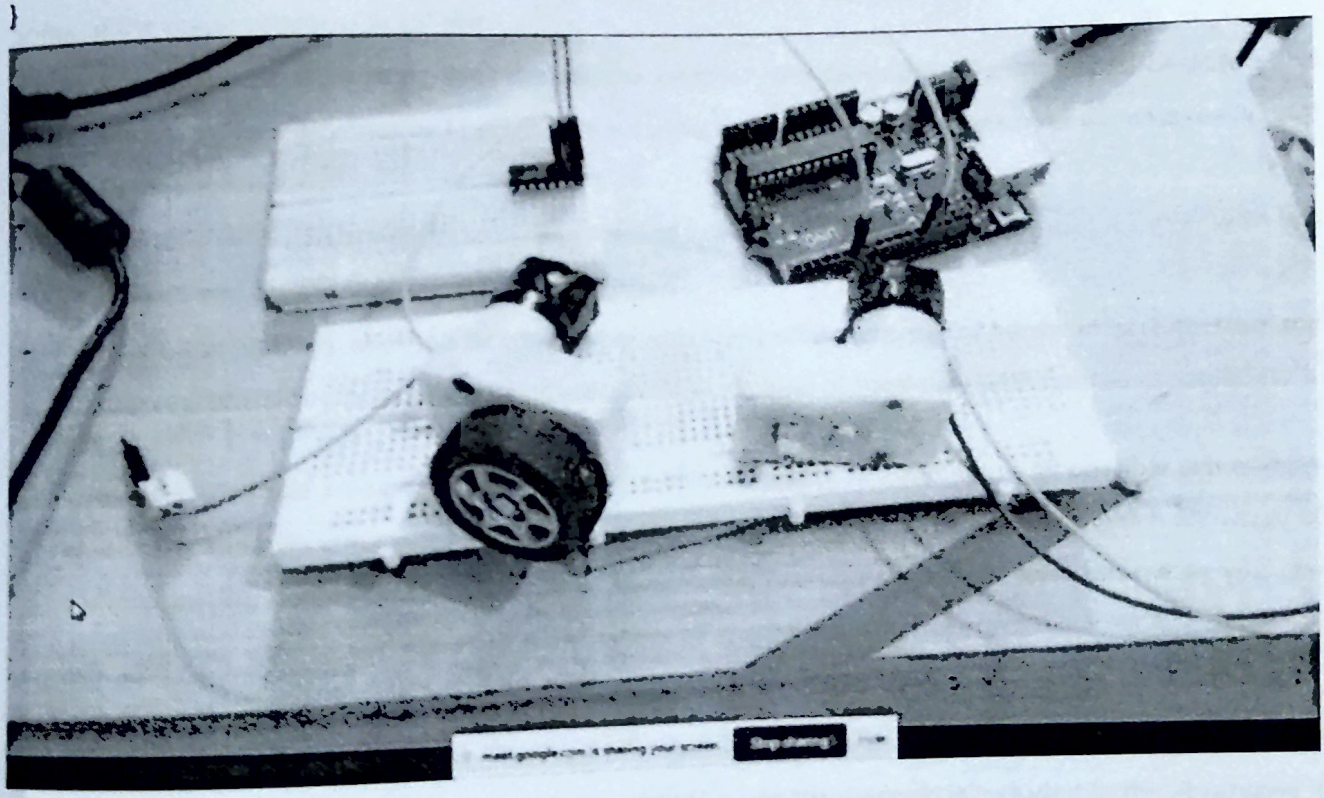

Fig.12: Making of the sample project

Others projects like controlling of seven segment display, smart dustbin etc. have also been done.

2.3 WEEK 3

2.3.1 Introduction to Blynk

Blynk is an **Internet-of-Things** platform designed to make development and implementation of smart IoT devices quick and easy. It can be used to read, store, and visualize sensor data and control hardware remotely.

Internet of Things has been all the buzz lately and more and more devices are beingtalking to internet every day. With the rise of such amazing technology, the risk ofsecurity has also increased substantially. Some of the major concerns in IoT are:

- If IoT devices are sending your data to the internet, the communication needs to beclosed and encrypted which cannot be possible without using a dedicated and closed server which is really hard to manage.
- The IoT devices also need to be responsive and again, that is not possible without a server with low latency and high responsiveness.
- In IoT, the platform needs to be compatible with many different types of hardwarearchitecture and devices, so that it doesn't restrict its users with single type of hardware with limited capabilities.

Blynk Server – The most amazing component of the Blynk Platform which makesit all possible is the Blynk Server. Blynk offers a secure, responsive and centralizedcloud service through its server which allows all of this communication between the devices. The Blynk server is also available as open source so you can literally make your own server and make it even more secure with a little tinkering.

Blynk Library – The key feature of Blynk platform which makes it scalable and amazing, is the Blynk Library. The Blynk Library makes it possible to connect yourhardware and get it up and running in a blink. The support for multiple hardware devices including Arduino, ESP8266 and Raspberry Pi is included in the libraryand it also makes it possible to connect with hardware through many different waysof communication like Wi-Fi, Bluetooth, BLE, USB and GSM.

CONFIGURING BLYNK

After the user installs the Blynk app on the smartphone, an account has to be createdin the app to access its services. The first time the app is opened, it will ask to eithersign in or create an account. Create an account and add a new project to get started.Each project has its own authentication code which is used by the code to communicate with that particular model. To interface with our components, we need to add

widgets to our model. To add widgets press „+" to add to the model. The app provides a neat interface to add all the required widgets and setting them up according to the code.

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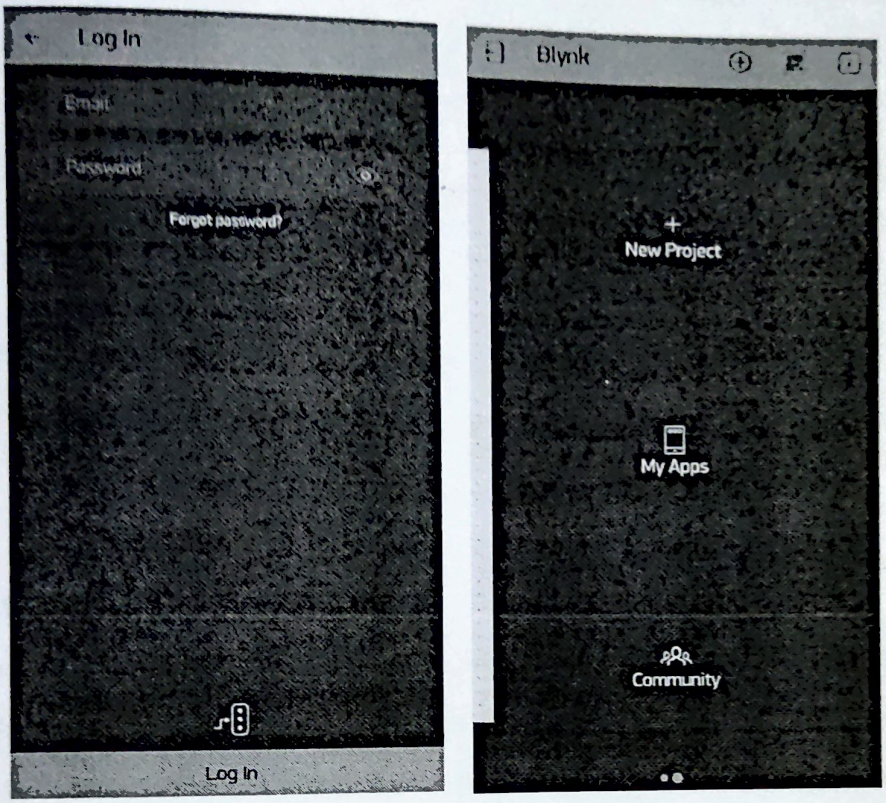

Fig.13: Picture of Configuring Blynk

by the code to communicate with that particular model. To interface with our components, we need to add widgets to our model. To add widgets press „+" to add to the model. The app provides a neat interface to add all the required widgets and setting them up according to the code. The Blynk needs to be running in the background for theuser to get real time notifications.

2.3.2 Sample projects using Blynk

Made a sample project of turning on/off light using Blynk.

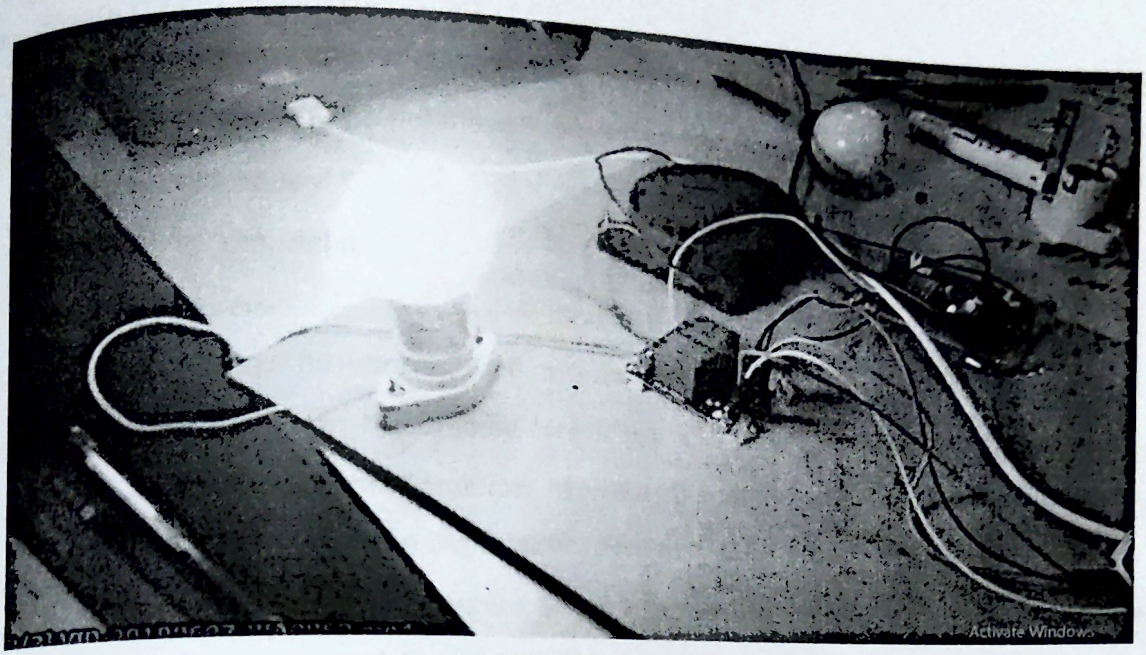

Fig.14: Making of project using Blynk

2.3.3 Introduction to Raspberry Pi

Raspberry Pi is a series of small single-board computers (SBCs) developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom. The Raspberry Pi project originally leaned towards the promotion of teaching basic computer science in schools and in developing countries. The original model became more popular than anticipated,[18] selling outside its target market for uses such as robotics. It is widely used in many areas, such as for weather monitoring, because of its low cost, modularity, and open design. It is typically used by computer and electronic hobbyists, due to its adoption of HDMI and USB devices.

Fig.15: Logo of Raspberry Pi

There are different versions of raspberry pi available as listed below:

- Raspberry Pi 1 Model A
- Raspberry Pi 1 Model A+
- Raspberry Pi 1 Model B
- Raspberry Pi 1 Model B+
- Raspberry Pi 2 Model B
- Raspberry Pi 3 Model B
- Raspberry Pi Zero

Hardware Components of Raspberry Pi are mention below:

- HDMI (High-Definition Multimedia Interface): It is used for transmitting uncompressed video or digital audio data to the Computer Monitor, Digital TV, etc. Generally, this HDMI port helps to connect Raspberry Pi to the Digital television.
- CSI Camera Interface: CSI (Camera Serial Interface) interface provides a connection in between Broadcom Processor and Pi camera. This interface provides electrical connections between two devices.
- DSI Display Interface: DSI (Display Serial Interface) Display Interface is used for connecting LCD to the Raspberry Pi using 15-pin ribbon cable. DSI provides fast High-resolution display interface specifically used for sending video data directly from GPU to the LCD display.
- Composite Video and Audio Output: The composite Video and Audio output port carries video along with audio signal to the Audio/Video systems.
- Power LED: It is a RED colored LED which is used for Power indication. This LED will turn ON when Power is connected to the Raspberry Pi. It is connected to 5V directly and will start blinking whenever the supply voltage drops below 4.63V.
- ACT PWR: ACT PWR is Green LED which shows the SD card activity.

2.4 WEEK 4

2.4.1 Implementation of the Project

Project titled "Voice Controlled Home Automation using Arduino-UNO" had done by me.

Abstract: Voice Controlled Home Automation Based on Bluetooth is a project that is integrated system with mobile phone(application) to give the facility to the elderly and the disable people, so that they can easily control home utilities fully based on their phone through voice command. The device is built in such a way that it will be easy to carry, install, configure, run and maintain for non-technical person. Home automation involves introducing to connect the certain electrical devices that are used in home.

Introduction: Home Automation is building automation for home, called a smart home. A home automation system will monitor or control electronic devices in your home. It controls home appliances by connecting them to a common remotely controllable network, making it much more accessible and convenient. With home automation, devices can trigger one another so we don't have to control them manually but via an app or voice assistant. It makes home management to a whole new level.

Objective: To control electronic appliances like light and fan via Bluetooth using Arduino and Android app with the help of voice.

Block Diagram:

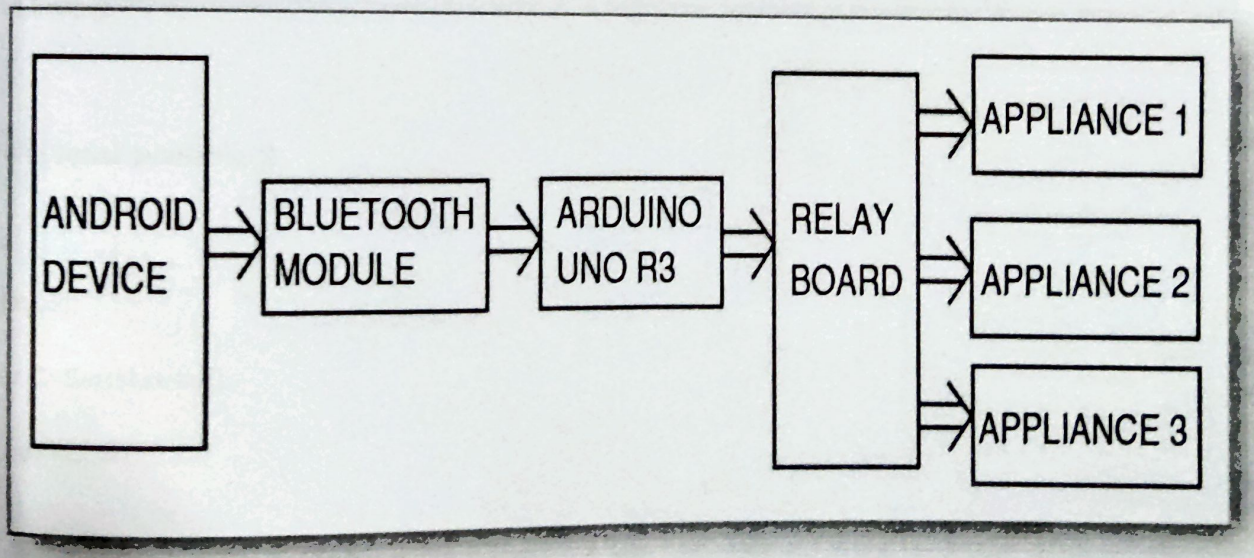

Fig.16: Block Diagram of the project titled 'Voice controlled home automation

Methodology:

- The proposed system controls the electrical home appliances through voice commands with the help of Bluetooth.
- Voice commands are given to the android application which is built.
- Bluetooth is connected between the android phone and Bluetooth module.
- Code is written and put to the Arduino which switches ON/OFF the load through the relay module.

Program:

```
String Voice;
Void setup()
{
Serial.begin(9600);
pinmode(6, OUTPUT);
pinmode(5, Output);
}
Void loop()
{
While(Serial.available())
{
Delay(3);
Char C=Serial.read();
Voice+=C;
}
If (voice.length()>0)
{
```

Methodology:

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- Voice commands are given to the android application which is built.
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Program:

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}

Void loop()

{

While(Serial.available())

{

Delay(3);

Char C=Serial.read();

Voice+=C;

}

If (voice.length()>0)

{
```

```
Serial.println(voice);
If(voice=="turn on fan")
{
digitalWrite(6,HIGH);
}
else if(voice=="turn off fan")
{
digitalWrite(6, LOW);
}
else if(voice=="turn on light")
{
digitalWrite(5, HIGH);
}
else if(voice=="turn off light")
{
digitalWrite(5, LOW);
}
else if(voice=="turn on all")
{
digitalWrite(6, HIGH);
digitalWrite(5, HIGH);
}
else if(voice=="turn off all")
```

```
{
digitalWrite(6, LOW);
digitalWrite(5, LOW);
}
Voice="";
}}
```

Application Design:

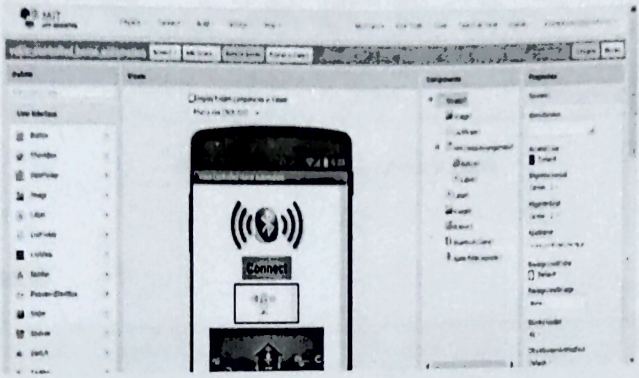

Fig.17: Snap of the design of app

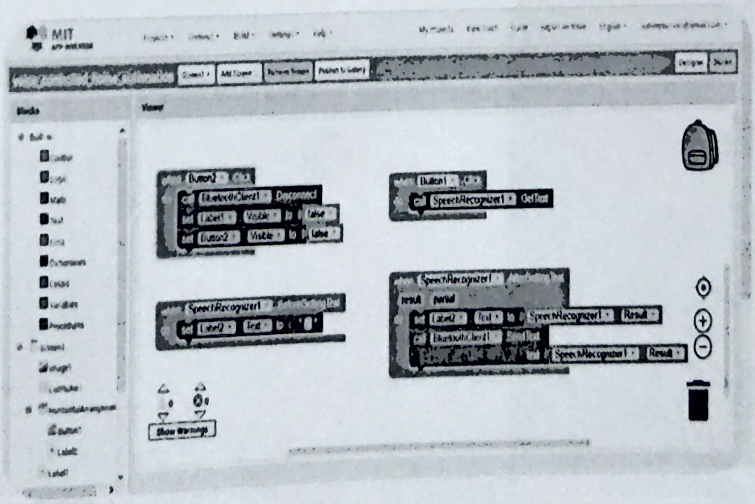

Fig.18: Blocks arranged in the application

Circuit Diagram:

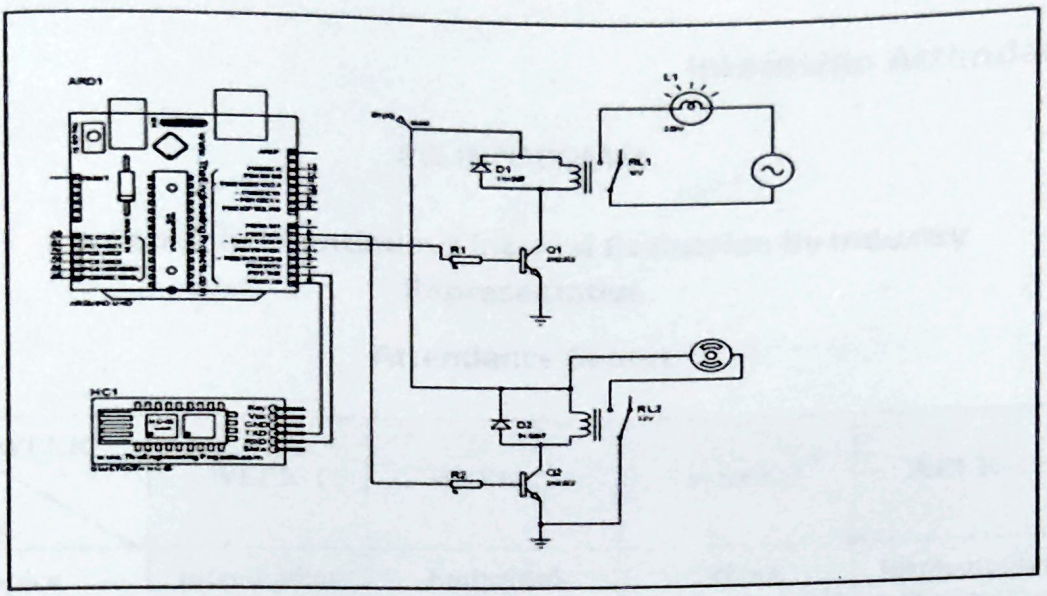

Fig.19: Circuit Diagram of the Project

Implementation of project:

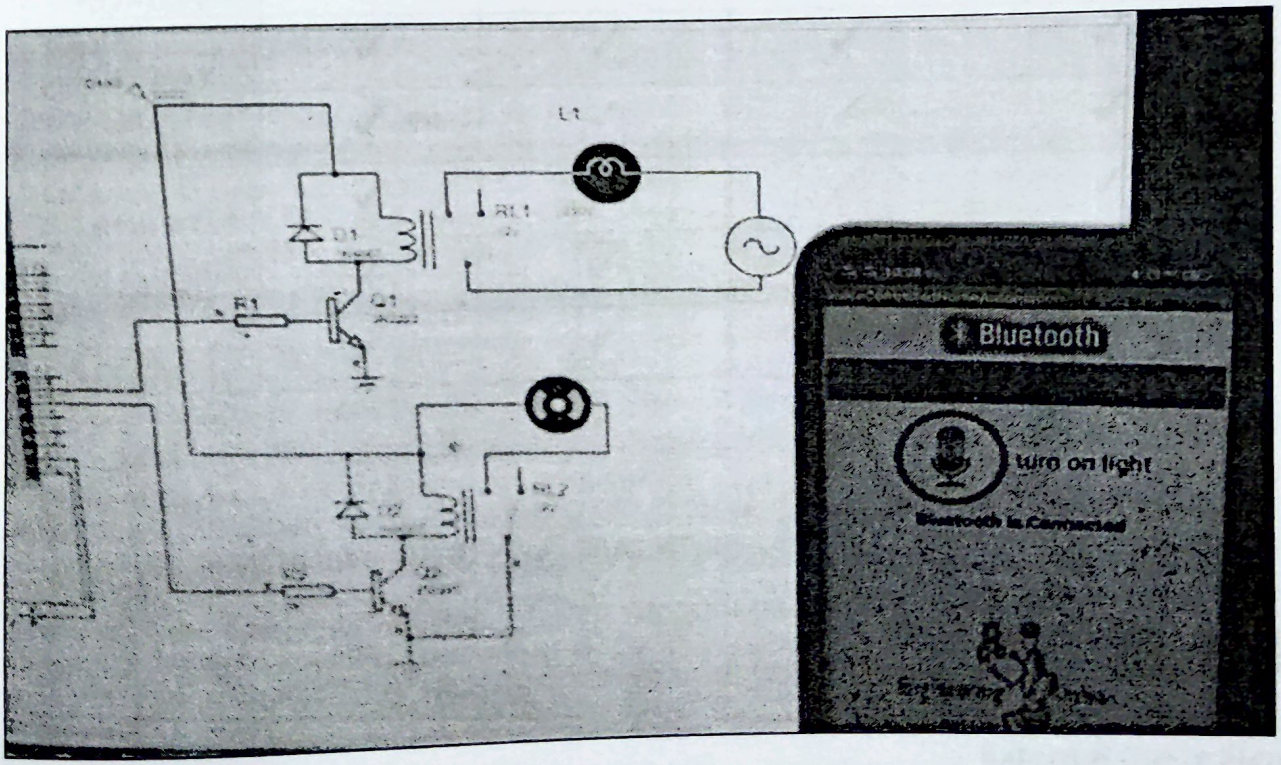

Fig.20: Picture of implemented project

Chapter 3

Internship Attendance Report

PIE INFOCOMM

Internship - Continuous Internal Evaluation by Industry Representative

Attendance Report

WEEK / DAYS	WEEK-1	WEEK-2	WEEK-3	WEEK-4 & 5
Topics	Introduction of IOT and basics of electronics.	Embedded systems and Proteus design Suite.	Blynk application and Raspberry Pi	Implementation and presentation of project
MONDAY	✓	✓	✓	✓
TUESDAY	✓	✓	✓	✓
WEDNESDAY	✓	✓	✓	✓
THURSDAY	✓	✓	✓	✓
FRIDAY	✓	✓	✓	✓
SATURDAY	✓	✓	✓	✓

Student Name : A Shreya

University Serial Number (USN) : 2BA18EE001

Name of the Company/Industry : PIE INFOCOMM

External Guide Signature

Chapter 4

Outcomes of the Internship

4.1 Outcomes of Internship

- Helped to gain in-depth technical knowledge of the IOT Technology.
- Helped to enhance technical skills in real time environment.
- Helped to understand the area of interest and selection of an area of specialization.
- Helped to learn the basics of how to work as a team member and complete given tasks.
- Real-time hands-on experience on projects that help to learn more analytically.
- Interaction with experts to get good practical exposure to technologies.

References:

- N. G. Nayak, F. Dürr and K. Rothermel, "Software-defined environment for reconfigurable manufacturing systems, "Internet of Things (IOT), 2015 5th International Conference on the, Seoul, 2015, pp. 122-129.

- Link to download the Proteus Design Suite Software
https://getintopc.com/softwares/electronics/proteus-8-6-professional-free-download/

- https://youtu.be/Kz8hKM4lnFk

- https://www.electronicwings.com/raspberry-pi/raspberry-pi-introduction