BVVS

Basaveshwar Engineering College, Bagalkote Department of Electronics and Communication Engineering

Vision, Mission Statements and Values

Vision

To achieve excellence in electronics and communication engineering through quality education and research for developing competent professionals.

Mission

- 1. Foster a dynamic teaching and learning process.
- 2. Encourage research through innovation and collaboration.
- 3. Imbibe moral, ethical values and social responsibilities.

Values

The values of the department are

- 1. Work is Worship
- 2. Ethics and Integrity
- 3. Empathy and Compassion
- 4. Indian Ethos
- 5. Mutual Respect

BVVS

Basaveshwar Engineering College, Bagalkote

Department of Electronics and Communication Engineering

SWOC Analysis

S:Strength:

- 1. Infrastructure
 - (i.) ICT enabled classrooms/seminar hall with good ambience.
 - (ii.) Well equipped laboratories to cater curriculum requirements.
 - (iii.) Department library with good number of titles and volumes.
 - (iv.) Scope for academic extension programmes.
- 2. Faculty
 - (i.) 75% of faculty with Ph.D.
 - (ii.) Faculty with minimum of 12 years teaching experience.
 - (iii.) Faculty retention ratio is 100 %.
- 3. Students
 - (i.) Students with academic and competitive bent of mind.
 - (ii.) 75% of the students are placed in reputed industries.
 - (iii.) 10% to 15% of the students are registering for B.E. Honours Degree.

4. Curriculum

- (i.) Research and industry oriented adaptive curriculum.
- (ii.) Curriculum with integrated courses.

5. Alumni

- (i.) Alumni works in reputed organizations across the world.
- (ii.) Alumni interactions with students and faculty to bridge the gap between campus and corporate.

W:Weakness:

- 1. IPR competencies are inadequate.
- 2. Relatively less number of memberships in professional bodies.
- 3. Limited collaborative activities.
- 4. Less number of inter-disciplinary courses and projects.
- 5. Less number of industry supported laboratories/courses.
- 6. Inadequate number of funded projects.
- 7. Less scope for co-curricular and cultural activities.

O:Opportunities:

- 1. Establishment of Distant Learning Center (DLC) using existing resources.
- 2. Participation in collaborative projects/ research work with allied institutions.
- 3. Fostering alumni participation in academics and placement activities.
- 4. Establishment of Skilling Centers for students.
- 5. Faculty exchange programs with academia and industry.
- 6. Organizing conferences.
- 7. Facilitating incubation centers for alumni.
- 8. Scope for academic extension programmes
- 9. Training on computer usage/ programming languages for general public.
- 10. Enhancing consultancy activities.

C:Challenges:

- 1. To incorporate experiential teaching learning process.
- 2. Adapting curriculum to future industry needs.
- 3. Fostering collaboration to enhance research, innovation and entrepreneurship activities.
- 4. Attracting diversified students.
- 5. Strategies to strengthen the placement activities for higher packages and core companies.
- 6. Secure additional research grants and consultancy opportunities.
- 7. Enhance quality publications and file patents.

Programme Outcomes

- a) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- b) **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c) **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- d) 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.
- e) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- f) The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- g) **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- h) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- i) **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- j) 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.

- k) 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 in multidisciplinary environments.
- Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

- **1.** Analyze and design systems for electronics, communication, and signal processing applications.
- **2.** Use domain specific tools for design, analysis, synthesis, and validation of VLSI and embeddedsystems
- **3.** Demonstrate the conceptual knowledge with respect to architecture, design analysis and simulation of computer networking and applications

Programme Educational Objectives (PEOs)

PEO1: Our graduates will be able to lead a successful career by solving complex Engineering Problems of society/industry

PEO2: Enable graduates to excel in academia, industry, entrepreneurship and engage in research and lifelong learning

PEO3: Graduates will be able to work effectively as individuals in multidisciplinary environments with high integrity, ethics, human values and societal responsibilities

PEO4: Graduates will be able to exhibit strong leadership, communication, and teamwork skills to succeed in dynamic professional environments and contribute to the global challenges

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						III SEMESTER									
							Т	eaching Hou	rs /Week			Exam	ination		
SI. No	Course	Course Code		Course Title		Teaching Department (TD)and Question Paper Setting Board (PSB)	1 Theory Lecture	Tutorial	Practical/ Drawing	SDA	Duration inhours	CIE Marks	SEE Marks	Total Marks	Credits
							L	Т	P	S					
1	PCC	22UMA312C	AV Mathe	matics-III for EC Engi	ineering	MATHEMATICS	3	0	0	0	03	50	50	100	3
2	IPCC	22UEC311C	Digital Sys	stem Design using Veri	ilog	ECE DEPT.	3	0	2	0	03	50	50	100	4
3	IPCC	22UEC312C	Electronic	Principles and Circuits	5	ECE DEPT.	3	0	2	0	03	50	50	100	4
4	PCC	22UEC313C	Network A	nalysis		ECE DEPT.	3	0	0	0	03	50	50	100	3
5	PCCL	22UEC314L	Analog and	d Digital Systems Desi	gn Lab	ECE DEPT.	0	0	2	0	03	50	50	100	1
6	ESC	22UEC315X	ESC/ETC/	PLC		ECE DEPT.	3	0	0	0	03	50	50	100	3
7	UHV	22UHS317L	Social Co	nnect and Responsib	oility	HSS DEPT.	0	0	2	0	01	100		100	1
	AEC/	22UEC316X					If t	he course is	a Theory		01				
8	SEC		Ability En	hancement Course/Ski	11	ECE DEPT.	1	0	0	0	01	50	50	100	1
0			Enhancem	entCourse-III			If a	course is a l	aboratory		02	50	50	100	1
							0	0	2	0					
		22UHS001M	Yoga			YOGA TEACHER									
9	MC	22UHS002M	National S	Service Scheme (NS	S)	NSS COORDINATOR	0	0	2	0		25		25	0
		22UHS003M	Physical I Athletics	Education (PE) (Spor)	ts and	PHYSICAL EDUCATION DIRECTOR								23	
		22UHS004M	Music			MUSIC TEACHER									
						Total	15/16	0	12		22	475	350	825	20
Sl. No	. Ability	y Enhancement	Course	Subject Code	Eng	ineering Science Co	urse	Subject	Code	Skill	Enhance	ement C	Course	Subject	Code
		(AEC)				(ESC)					(SE	EC)			
1.	C++ Bas	sics		22UEC316A	Electronic	c Devices		22UEC	315A	MATL	AB Progra	mming		22UEC3	816C
2. IOT for Smart Infrastructure 22UEC316B Computer Organization and Architecture 22UEC315B LABVIEW programming 22UEC316D															
3.					Sensors a	nd Instrumentation		22UEC	315C						
4.					Applied N	Numerical Methods for EC	Engineers	22UEC	315D						
PCC:	PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course(Non-credit), AEC: Ability Enhancement Course, SEC: Skill Enhancement Course Lil acture T: Tutorial P:PracticelS=SDA: SkillDauelopment Activity CH: Continuous Internal Evaluation SXX:														
	Emancem	ent Course, SEC:	Skin Elina	icement Course,L:	Lecture, I	. I utoriai, r . Practical S=S	DA.SKIIID	evelopine	IntActivit	y,CIE:	Continuo	usimerna	nevaluat	.1011, 5AA :	

AY: 2023-24

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			IV SEMESTER	SEMESTER										
						Tea	ching Ho	ours /Wee	ek		Exa	nination		
SI. No	Course	e andCourse Code	C	ourse Title	Teaching Department (TD)and Question Paper Setting Board (PSB)	Theory Lecture	Tutorial	Practical/ Drawing	Self-Study	Duration inhours	CIE Marks	SEE Marks	Total Marks	credits
						L	Т	Р	S					0
1	PCC	22UEC410C	Electromagnetic Theo	ory	ECE DEPT.	3	0	0	0	03	50	50	100	3
2	IPCC	22UEC411C	Principles of Commun	nication Systems	ECE DEPT.	3	0	2	0	03	50	50	100	4
3	IPCC	22UEC412C	Control Systems		ECE DEPT.	3	0	2	0	03	50	50	100	4
4	PCCL	22UEC413C	Communication Lab		ECE DEPT.	0	0	2	0	03	50	50	100	1
5	ESC	22UEC4XXC	ESC/ETC/PLC		ECE DEPT.	3	0	0	0	03	50	50	100	3
						If the co	ourse is T	heory		01				
6		22UEC4XXC	Ability Enhancement	Course/Skill	ECE DEPT.	1	0	0	0	- 01	50	50	100	1
0	SEC		Ennancement Course	- 1V		If the	course is	a lab			50	50	100	1
						0	0	2	0	02				
7	BSC	22UBT407C	Biology For Engineers	;	ECE DEPT.	3	0	0	0	03	50	50	100	3
8	UHV	22UHS424C	Universal human valu	es course	ECE DEPT.	1	0	0	0	01	50	50	100	1
9		22UHS001M	Yoga		YOGA TEACHER									
	MC	22UHS002M	National Service Sch	eme (NSS)	NSS COORDINATOR									
	MC	22UHS003M	Physical Education (I	PE) (Sports and Athletics)) PHYSICAL EDUCATION DIRECTOR	0	0	2	0		25		25	0
		22UHS004M	Music		MUSIC TEACHER									
			,		Total	16/17	0	10		24	500	400	900	20
PCC:	Professional	Core Course, PO	CCL: Professional C	ore Course laboratory.	UHV: Universal Human Va	alue Course	MC: N	Mandate	orv Course(N	Jon-credi	t).AEC: A	bility	1	
1001		Enhancen	nent Course, SEC: S	kill Enhancement Cour	rse, L:Lecture, T:Tutorial, P:I	PracticalS=	SDA:Sk	cillDeve	lopmentActi	ivity, CIE	Continuo	usInternalE	Evaluation	,SXX:
	Sl. No.	Ability Enha	incement Course	Subject Code E	ngineering Science Cou	rse Sub	iect C	ode S	Skill Enhar	ncement	t Course	Subject	Code	,
		, i i j	AEC	je na se	ESC		J · · · ·		(SEC)		j		
	1.	Octave Program	ning	22UEC415A Da	ata Structures using C	22	UEC414	A D	Data Structure	s Lab usin	g C	22UEC	415C	
	2.	Programmable I	Logic Controllers	22UEC415B Mi	icrocontrollers	22	UEC414	B N	Aicrocontrolle	ontroller Lab		22UEC	415D	
	3.			Inc	dustrial Electronics	22	22UEC414C							
	4.			Op	perating Systems	22UEC414D								
	5.			Sig	gnals and Systems	22	22UEC414E							

	1			V SEMEST	TER									
SI. No	C	Course and Durse Code	Course Title	Teaching Department(TD) and Question Paper Setting Board(PSB)	Teaching Department(TD) and Question Paper Setting Board(PSB)		Tea Intorial	Practical/Dr build awing awing	/Week VQS	Duration in hours	IBX3 CIE Marks CIE	nination SEE Marks	Total Marks	Credits
			Technological Improveding and Management	ECE DEPT		L	Т	Р	S					
1	HSMS	22UEC512C	Entrepreneurship	ECE DEPT		3	0	0	0	03	50	50	100	3
2	IPCC	22UEC513C	Digital Signal Processing	ECE DEPT		3	0	2	0	03	50	50	100	4
3	PCC	22UEC514C	Digital Communication	ECE DEPT		4	0	0	0	03	50	50	100	4
4	PCCL	22UEC515L	Digital Communication Lab	ECE DEPT		0	0	2	0	03	50	50	100	1
5	PEC	22UEC5XXE	Professional Elective Course	ECE DEPT		3	0	0	0	03	50	50	100	3
6	PROJ	22UEC517P	Mini Project	ECE DEPT		0	0	4	0	03	100		100	2
7	AEC	22UHS507C	Research Methodology and IPR	ECE DEPT		2	2	0	0	02	50	50	100	3
8	MC	22UBT508C	Environmental Studies	ANY DEPARTM	1ENT	2	0	0	0	02	50	50	100	2
		22UHS001M	Yoga	YOGA TEACH	ER									
9	MC	22UHS002M	National Service Scheme (NSS)	NSS COORDINA	TOR	0	0	2	0		25		25	0
		22UHS003M	Physical Education (PE) (Sports and Athletics)	PHYSICAL EDUCA DIRECTOR	ATION								23	
		22UHS004M	Music	MUSIC TEACH	IER									
10	AC	22UHS521C	Qualitative Aptitude and Soft Skills	TPC		2	0	0	0	2	100		100	0
			Total			19	2	10	0	24	650	350	1000	22
				Professional Electi	ve Cour	se								
1.	Intelligen	t Systems and M	achine Learning Algorithms		22UEC	521E								
2.	Digital Sv	witching and Fin	ite Automata Theory		22UEC	522E								
3.	Data Stru	cture using C++			22UEC	523E								
4.	Satellite a	Ind Optical Com			22UEC	524E		X 1.	C		10 4 5 6	A 1 *1*.		
PCC	: Profession	nal Core Course,	, PCCL: Professional Core Course laboratory, U	HV : Universal Hu	iman Va	lue Cour	se, MC	: Mandato	ry Course	(Non-cre	dit),AEC:	Ability		

Enhancement Course, SEC: Skill Enhancement Course, L:Lecture, T:Tutorial, P:Practical S=SDA: SkillDevelopmentActivity, CIE: Continuous Internal Evaluation, SXX:, AC: Audit Course

VI SEMESTER

								Teachin	g Hours/Wee	k	Examinati	on			
Sl.No	Cou Cour	rse and se Code	Course Title		Teaching Department(TD) and Question Paper Setting Board(PSB)		T Theory Lecture	Tutorial	d Practical/Dr awing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
1	IPCC	22UEC6110	E Embedded System Design		ECE	DEPT	3	0	2	0	03	50	50	100	4
2	PCC	22UEC6120	C VLSI Design and Testing		ECE DEPT		4	0	0	0	03	50	50	100	4
3	PEC	22UEC6XX	E Professional Elective Course		ECE	DEPT	3	0	0	0	03	50	50	100	3
4	OEC	22UECXXX	N Open Elective Course		RESPEC	TIVE DEPT	3	0	0	0	03	50	50	100	3
5	PROJ	22UEC619I	P Major Project Phase I		ECE	DEPT	0	0	4	0	03	100		100	2
6	PCCL	22UEC620I	VLSI Design and Testing Lab		ECE	DEPT	0	0	2	0	03	50	50	100	1
7	AEC	22UHS6000	C Indian Knowledge System		ECE	ECE DEPT		course is	offered as	a Theory					
							1	0	0	0	01	50	50	100	1
							If cou	irse is of	ffered as a p	ractical					
							0	0	2	0					
		22UHS001	M Yoga		YOGA	FEACHER									
8	MC	22UHS002	M National Service Scheme (NSS)		NSS COO	RDINATOR		0	2	0		25			0
			Physical Education (PE) (Sports and Atl	hletics)	PHYSICAL	FDUCATION	0	0	2	0		23		25	U
		22UHS003	M M	metres)	DIRE	ECTOR									
		22UHS004	M Music		MUSIC '	TEACHER	-								
			Total				14/13	0	12/10	0	19	500	300	800	18
	S1.Professional Elective Course (PEC)Subject		ct Code	Ор	en Elect (O	ive Co E)	urse		Subject	Code					
	1. Multimedia Communication		22UE	C621E	Digital Syst	tem Desi	gn usin	g Verilog		22UECX	XXXN				
	2. Digital Image Processing		22UE	C622E	Electronic C	Communi	cation S	Systems		22UEC	XXXN				
	3. Computer and Data Security		22UE	C623E	Consumer I	er Electronics				22UECXXXN					
		4.	FPGA System Design using Verilog	22UE	C624E	Basic VLSI	Design				22UECXXXN				

				v	TI SEMESTER	(Swappable VII a	nd V	/III SEN	MESTE	R)						
								ŗ	Teaching	Hours/Week			Exan	nination		
SI. No		Cour Cours	rse and se Code	Course Title		Teaching Department(TD) and Question Paper Setting Board(PSB)		Theory Lecture	Tutorial	Practical/Dr awing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	edits
Image: Image in the image i												C.				
1	IPCC 22UEC720C Microwave Engineering and Antenna Theory ECE DEPT 3 0 2 0 03 50 50 100 4											4				
2 IPCC 22UEC721C Computer Networks and Protocols ECE DEPT 3 0 2 0 03 50 50 100										4						
3 PCC 22UEC722C Wireless Communication Systems ECE DEPT 4 0 0 03 50 50 100									4							
4	PEC 22UEC7XXE Professional Elective Course					RESPECTIVE DEF		3	0	0	0	03	50	50	100	3
5	OEC	,	22UECXXX N	Open Elective Course		ECE DEPT		3	0	0	0	03	50	50	100	3
6	PROJ	r i	22UEC724P	Major Project Phase-II		ECE DEPT		0	0	12	0	03	100	100	200	6
								16	0	16	0	18	350	350	700	24
S1.	No.		Profess	sional Elective Course (PEC)	Subjec	ct Code			Ор	en Electiv (OE	v <mark>e Course</mark>)			Sub	ject Code	e
	1.	Appl	ication Specif	ic Integrated Circuit	22UE	C731E	E-w	vaste Mai	nageme	nt				22U	ECXXXN	
	2. Automotive Electronics 22UEC732E Embedded System Applications 22UECXXXN															
	3. Cyber Security 22UEC733E Automotive Electronics 22UECXXXN															
	4. Radar Communication 22UEC734E Sensors and Actuators 22UECXXXN															
L:I	L:Lecture, T:Tutorial, P:Practical S=SDA:SkillDevelopmentActivity, CIE:ContinuousInternalEvaluation, SEE:SemesterEndEvaluation.TD-TeachingDepartment, PSB: PaperSettingdepartment, OEC:OpenElectiveCourse, PEC:ProfessionalElectiveCourse.PROJ:Projectwork, INT:IndustryInternship/ResearchInternship/RuralInternship															

			VIII SEMESTER (S	wappable V	II and 	VIII SEN	MESTE	ER)						
							Teaching	g Hours/Wo	eek	Examination	on		-	
SLN o	SLN Course and Course Title		(eaching Department(TD) and Question Paper Setting Roard(PSB)		Theory Lecture	Tutorial	Practical/Dr awing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	dits	
				- пенн	•	L	Т	Р	S					Cre
1 PEC 22UECXXXX Professional Elective (Online Courses) MOOCS 3 0 0 03 50 50 100									3					
2	OEC			3	0	0	0	01	50	50	100	3		
3	INT	22UEC811T	Internship (Industry/Research) (14-20weeks)			0	0	12	0	03	100	100	200	10
			Total			6	0	12	0	07	200	200	400	16
			Profes	sional Electi	ive Cour	rse								
		BOS Recomm	nended Course				BOS	Recomm	ended Co	ourse				
		BOS Recomm	nended Course				BOS	Recomm	ended Co	ourse				
			Оре	en Elective (Courses									
		BOS Recomm	nended Course				BOS	Recomm	ended Co	ourse				
	BOS Recommended Course BOS Recommended Course													
L:Lect	ure, T :Tut	orial, P :Practica	IS=SDA:SkillDevelopmentActivity,CIE:Continue	ousInternalEv	valuatior	n, SEE :Se	emester	EndEval	uation. T I	D- Teachir	ngDepartn	nent, PSB :		
PaperS	perSettingdepartment, OEC: OpenElectiveCourse, PEC: ProfessionalElectiveCourse. PROJ: Projectwork, INT: IndustryInternship/ResearchInternship/RuralInternship													

III Semester Syllabus

AV Mathematics-I	II for EC Engineering	Semester	3
Course Code	22UMA312C	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives:

- 1. Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis and to enable the student to express non-periodic functions to periodic functions using the Fourier series and Fourier transforms.
- 2. Analyze signals in terms of Fourier transforms
- 3. Develop the knowledge of solving differential equations and their applications in Electronics & Communication engineering.
- 4. To find the association between attributes and the correlation between two variables

Teaching-Learning Process Pedagogy

(General Instructions):

These are sample Strategies; teachers can use to accelerate the attainment of the various course outcomes.

- 1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.
- 2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
- 3. Support and guide the students for self-study.
- 4. You will assign homework, grading assignments and quizzes, and documenting students' progress.
- 5. Encourage the students to group learning to improve their creative and analytical skills.
- 6. Show short related video lectures in the following ways:
 - i.As an introduction to new topics (pre-lecture activity).
 - ii.As a revision of topics (post-lecture activity).

iii.As additional examples (post-lecture activity).

iv.As an additional material of challenging topics (pre-and post-lecture activity).

v.As a model solution of some exercises (post-lecture activity).

Module-1: Fourier series and practical harmonic analysis

Periodic functions, Dirichlet's condition. Fourier series expansion of functions with period 2π and with arbitrary period: periodic rectangular wave, Half-wave rectifier, rectangular pulse, Saw tooth wave. Half-range Fourier series. Triangle and half range expansions, Practical harmonic analysis, variation of periodic current. (8 hours)

Module-2: Infinite Fourier Transforms

Infinite Fourier transforms, Fourier cosine and sine transforms, Inverse Fourier transforms, Inverse Fourier cosine and sine transforms, discrete Fourier transform (DFT), Fast Fourier transform (FFT). **(8 hours)**

Module-3: Z Transforms Definition, Z-transforms of basic sequences and standard functions. Properties: Linearity, scaling, first and second shifting, multiplication by n. Initial and final value theorem. Inverse Z- transforms. Application to difference equations. (8 hours)

Module-4:

Ordinary Differential Equations of Higher Order

Higher-order linear ODEs with constant coefficients - Inverse differential operator, problems. Linear differential equations with variable Coefficients-Cauchy's and Legendre's differential equations–Problems. Application of linear differential equations to L-C circuit and L-C-R circuit. (8 hours)

Module-5:

Curve fitting, Correlation, and Regressions

Principles of least squares, Curve fitting by the method of least squares in the form

y = a + bx, $y = a + bx + cx^2$, and $y = ax^b$. Correlation, Coefficient of correlation, Lines of regression, Angle between regressions lines, standard error of estimate, rank correlation. (8 hours)

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing, and field theory.
- 2. To use Fourier transforms to analyze problems involving continuous-time signals
- 3. To apply Z-Transform techniques to solve difference equations
- 4. Understand that physical systems can be described by differential equations and solve such equations
- 5. Make use of correlation and regression analysis to fit a suitable mathematical model for statistical data

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module(with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- 4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)Text Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna Publishers, 44thEd., 2021.

2. E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10thEd., 2018.

Reference Books:

- 1. V. Ramana: "Higher Engineering Mathematics" McGraw-Hill Education, 11thEd., 2017
- 2. Srimanta Pal & Subodh C.Bhunia: "Engineering Mathematics" Oxford University Press, 3rdEd., 2016.
- 3. **N.P Bali and Manish Goyal**: "A Textbook of Engineering Mathematics" Laxmi Publications, 10thEd., 2022.
- 4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw–HillBook Co., New York, 6thEd., 2017.
- 5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I andII", McGraw Hill Education(India) Pvt. Ltd 2015.
- 6. **H.K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rdEd.,2014.

7. James Stewart: "Calculus" Cengage Publications, 7thEd., 2019.

Web links and Video Lectures (e-Resources):

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program.

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

Digital System De	esign using Verilog	Semester	3
Course Code		CIE Marks	50
	22UEC311C		
Teaching Hours/Week (L:T:P: S)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory/Prac	tical	

Course objectives:

This course will enable students to:

- 1. To impart the concepts of simplifying Boolean expression using K-map techniques and Quine- McCluskey minimization techniques.
- 2. To impart the concepts of designing and analyzing combinational logic circuits.
- 3. To impart design methods and analysis of sequential logic circuits.
- 4. To impart the concepts of Verilog HDL-data flow and behavioral models for the design of digital systems.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain the different concepts of Linear Algebra & Signal Processing.
- 3. Encourage collaborative (Group) Learning in the class.
- 4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- 6. Topics will be introduced in a multiple representation.
- 7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- 8. Discuss how every concept can be applied to the real world-and when that's possible, it helps improve the students' understanding.
- 9. Adopt Flipped class technique by sharing the materials/Sample Videos prior to the class and have discussions on the topic in the succeeding classes.
- 10. Give Programming Assignments.

MODULE-1

Principles of Combinational Logic: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps up to 4 variables, Quine-McCluskey Minimization Technique. Quine-McCluskey using Don't Care Terms. (Section 3.1 to 3.5 of Text1).

MODULE-2

Logic Design with MSI Components and Programmable Logic Devices: Binary Adders and Subtractors, Comparators, Decoders, Encoders, Multiplexers, Programmable Logic Devices (PLDs) (Section 5.1 to 5.7 of Text 2)

MODULE-3

Flip-Flops and its Applications: The Master-Slave Flip-flops (Pulse-Triggered flip-flops): SR flip- flops, JK flip flops, Characteristic equations, Registers, Binary Ripple Counters, Synchronous Binary Counters, Counters based on Shift Registers, Design of Synchronous mod-n Counter using clocked T, J K, D and SR flip-flops. (Section 6.4, 6.6 to 6.9 (Excluding 6.9.3) of Text 2), State diagrams.

MODULE-4

Introduction to Verilog: Structure of Verilog module, Operators, Data Types, Styles o Description. (Section 1.1 to1.6.2, 1.6.4 (only Verilog), 2 of Text 3)

Verilog Data flow description: Highlights of Data flow description, Structure of Data flow description. (Section 2.1 to 2.2 (only Verilog) of Text 3)

MODULE-5

Verilog Behavioral description: Structure, Variable Assignment Statement, Sequential Statements, Loop Statements, Verilog Behavioral Description of Multiplexers (2:1, 4:1, 8:1). (Section 3.1 to 3.4 (only Verilog) of Text 3)

Verilog Structural description: Highlights of Structural description, Organization of structural description, Structural description of ripple carry adder.(Section 4.1 to 4.2 of Text3)

PRACTICAL COMPONENT OF IPCC (*Experiments can be conducted either using any circuit simulation software or discrete components*)

Sl. No.	Experiments									
1	To simplify the given Boolean expressions and realize using Verilog program									
2	To realize Adder/Subtract or (Full/half) circuits using Verilog data flow description.									
3	To realize 4-bit ALU using Verilog program.									
4	To realize the following Code converters using Verilog Behavioral description a) Gray to binary and vice versa b) Binary to excess3 and vice versa									
5	To realize using Verilog Behavioral description: 8:1 mux, 8:3 encoder, and Priority encoder									
6	To realize using Verilog Behavioral description: 1:8 De-mux, 3:8 decoder, 2–bit Comparator									
7	To realize using Verilog Behavioral description: Flip-flops: a) JK type b) SR type c) T type and d) D-type									
8	To realize Counters-up/down (BCD and binary) using Verilog Behavioral description.									
9	Write Verilog code for the given sequential circuit problem statement or state diagram.									
Demonst	Demonstration Experiments (For CIE only–not to be included for SEE)									

Use FPGA/CPLD kits for down loading Verilog codes and check the output for inter facing experiments.

10	Verilog Program to interface a Stepper motor to the FPGA/CPL D and rotate the
	motor in the specified direction (by N steps).

11 Verilog programs to interface Switches and LEDs to the FPGA/CPLD and demonstrate its working.

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- 1) Simplify Boolean functions using K-map and the Quine-McCluskey minimization technique.
- 2) Analyze and design combinational logic circuits.
- 3) Analyze the concepts of flip-flops (SR, D, T, and JK) and design synchronous sequential circuits using flip-flops.
- ⁴) Model combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.

Assessment Details (Both CIE and SEE):

The weightage of Continuous Internal Evaluation (CIE) is 50%, and the weightage for the Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 out of 50), and for the SEE, the minimum passing mark is 35% of the maximum marks (18 out of 50). A student is declared to have passed the course if he/she secures a minimum of 40% (40 marks out of 100) in the combined total of the CIE and SEE. The **IPCC** refers to the practical portion integrated with the theory of the course. CIE marks for the theory component are 25 marks, and the practical component is also 25 marks.

CIE for the Theory Component of the IPCC:

- 1. The 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (each test is 15 marks with duration of 1 hour) and 10 marks for other assessment methods mentioned in 22OB4.2. The first test is conducted after 40-50% of the syllabus is covered, and the second test after 85-90% of the syllabus is covered.
- 2. The scaled-down marks from the sum of the two tests and other assessment methods will be the CIE marks for the theory component of the IPCC (out of 25 marks).
- 3. The student must secure 40% of the 25 marks to qualify in the CIE for the theory component of the IPCC.

CIE for the Practical Component of the IPCC:

- 1. 15 marks are allocated for the conduction of experiments and the preparation of the laboratory record, and 10 marks are allocated for a test to be conducted after the completion of all laboratory sessions.
- 2. Upon completing each experiment/program in the laboratory, students will be evaluated, including a viva-voce, and marks will be awarded on the same day.
- 3. The CIE marks for the practical component will be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. The total marks for all experiment write-ups will be added and scaled down to 15 marks.
- 4. A laboratory test (duration of 2-3 hours) will be conducted after the completion of all experiments, with a maximum score of 50 marks, scaled down to 10 marks.
- 5. The scaled-down marks from the write-up evaluations and the test will be added to form the CIE marks for the laboratory component of the IPCC, out of 25 marks.
- 6. The student must secure 40% of the 25 marks to qualify in the CIE for the practical component of the IPCC.

SEE for IPCC:

The Theory SEE will be conducted by the university as per the scheduled timetable, with common question papers for the course (duration: 3 hours).

- 1. The question paper will have ten questions, each worth 20 marks.
- 2. There will be two questions from each module. Each of the two questions under a module (with a maximum of three sub-questions) will cover a mix of topics from that module.
- 3. Students must answer five full questions, selecting one full question from each module.
- 4. The marks scored by the student will be proportionally scaled down to 50 marks.

The theory portion of the IPCC will be assessed through both CIE and SEE, while the practical portion will have a CIE component only. Questions in the SEE paper may include content from the practical component.

- 1. The minimum marks required in CIE to be eligible for SEE are 10 (40% of the maximum marks—25) in the theory component and 10 (40% of the maximum marks—25) in the practical component. The laboratory component of the IPCC is assessed through CIE only, but SEE may include questions from the practical component. A maximum of 4-5 sub-questions from the practical component of the IPCC can be set, with a total weightage of no more than 20 marks.
- 2. SEE will be conducted for 100 marks, and students must secure 35% of the maximum marks to qualify for SEE. Marks scored in SEE will be scaled down to 50.
- **3.** A student is declared to have passed the course if he/she secures a minimum of 40% (40 marks out of 100) in the combined total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination).

Suggested Learning Resources:

Books:

- 1. Digital Logic Applications and Design by John M. Yarbrough, Thomson Learning, 2001.
- 2. Digital Principles and Design by Donald D. Givone, McGraw Hill, 2002.
- 3. HDL Programming: VHDL and Verilog by Nazeih M. Botros, 2009 reprint, Dreamtech Press.

Reference Books:

- 1. Fundamentals of Logic Design by Charles H. Roth Jr., Cengage Learning.
- 2. Logic Design by Sudhakar Samuel, Pearson/Sanguine, 2007.
- 3. Fundamentals of HDL by Cyril P. R., Pearson/Sanguine, 2010.

Web links and Video Lectures (e-Resources):

www.chipverify.com

Activity-Based Learning (Suggested Activities in Class) / Practical-Based Learning:

Programming assignments and mini-projects can be assigned to improve programming skills.

Course Anticulation Matrix.						D							D	an	
Course Outcomes						PC	Js						P	'SOs	5
	A	b	c	d	e	f	g	h	i	j	k	1	m	n	0
CO1: Simplify Boolean functions using K- map and the Quine-McCluskey minimization technique.	2	3	1	2	0	0	0	0	0	0	0	0	0	3	0
CO2: Analyze and design combinational logic circuits.	2	3	1	2	0	0	0	0	0	0	0	0	0	3	0
CO3: Analyze the concepts of flip-flops (SR, D, T, and JK) and design synchronous sequential circuits using flip-flops.	2	3	1	2	0	0	0	0	0	0	0	0	0	3	0
CO4: Model combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.	2	2	1	2	3	0	0	0	0	0	0	0	0	3	0

Electronic Pr	inciples and Circuits	Semester	3
Course Code	22UEC312C	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	
Examination nature (SEE)	Theory/Practical/Viva-Voce /Term-work	x/Others	

Course objectives:

This course will enable students to

- 1. Design and analyze the BJT circuits as an amplifier and voltage regulation.
- 2. Design of MOSFET Amplifiers and analyze the basic amplifier configurations using small signal equivalent circuit models
- 3. Design of operational amplifiers circuits as Comparators, DAC and filters.
- 4. Understand the concept of positive and negative feedback.
- 5. Analyze Power amplifier circuits in different modes of operation.
- 6. Construct Feedback and Oscillator circuits using FET.
- 7. Understand the thyristor operation and the different types of thyristors.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain evolution of communication technologies.
- 3. Encourage collaborative (Group) Learning in the class
- 4.Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

MODULE -1 **Transistor Biasing:** Voltage Divider Bias, VDB Analysis, VDB Load line and Q point, Two supply Emitter Bias, Other types of Bias.

BJT AC models: Base Biased Amplifier, Emitter Biased Amplifier, Small Signal Operation, AC Beta, AC Resistance of the emitter diode, two transistor models, Analyzing an amplifier, H parameters, Relations between R and H parameters.

Voltage Amplifiers: Voltage gain, Loading effect of Input Impedance.

CC Amplifiers: CC Amplifier, Output Impedance.

[Text1]

MODULE -2

MOSFET

Biasing in MOS amplifier circuits: Fixing VGS, Fixing VG, Drain to Gate feedback resistor. Small signal operation and modelling: The DC bias point, signal current in drain, voltage gain, small signal equivalent circuit models, trans conductance, The T equivalent circuit model. MOSFET Amplifier configuration: Basic configurations, characterizing amplifiers, CS amplifier with and without source resistance, The Common Gate Amplifier, Source follower. [Text 2]

MODULE-3

Linear Op-amp Circuits: Summing Amplifier and D/A Converter, Nonlinear Op-amp Circuits: Comparator with zero reference, Comparator with non-zero references. Comparator with Hysteresis.

Oscillator: Theory of Sinusoidal Oscillation, The Wein-Bridge Oscillator, RC Phase Shift Oscillator, The Colpitts Oscillator, Hartley Oscillator, Crystal Oscillator.

The 555 timer: Monostable Operation, Astable Operation. [Text1]

MODULE-4

Negative Feedback: Four Types of Negative Feedback, VCVS Voltage gain, Other VCVS Equations, ICVS Amplifier, VCIS Amplifier, ICIS Amplifier (No Mathematical Derivation).

Active Filters: Ideal Responses, First Order Stages, VCVS Unity Gain Second Order Low Pass Filters, VCVS Equal Component Low Pass Filters, VCVS High Pass Filters, MFB Band Pass Filters, Band stop Filters. [Text1]

MODULE-5

Power Amplifiers: Amplifier terms, two load lines, Class A Operation, Class B operation, Class B push pull emitter follower, Class C Operation.

Thyristors: The four-layer Diode, SCR, SCR Phase control, Bidirectional Thyristors, IGBTs, Other Thyristors. [Text1]

PRACTICAL COMPONENT OF IPCC (*Experiments can be conducted either using any circuit simulation software or discrete components*)

Sl.NO	Experiments
1	Design and Test Bridge Rectifier with Capacitor Input Filter Zener voltage regulator
2	Design and Test Biased Clippers – a)Positive, b) Negative, c) Positive-NegativePositive and Negative Clampers with and without Reference.
3	Plot the transfer and drain characteristics of a JFET and calculate its drain resistance, mutual conductance and amplification factor.
4	Plot the transfer and drain characteristics of n-channel MOSFET and calculate its parameters, namely; drain resistance, mutual conductance and amplification factor.
5	Design and test Emitter Follower
6	Design and plot the frequency response of Common Source JFET/MOSFET amplifier
7	Test the Op-amp Comparator with zero and non-zero reference and obtain the Hysteresis curve.
8	Design and test Full wave Controlled rectifier using RC triggering circuit.
9	Design and test Precision Half wave and full wave rectifiers using Op-amp
10	Design and test RC phase shift oscillator
Course	e outcomes (Course Skill Set):
At the o	end of the course, the student will be able to:
1.	Understand the characteristics of BJTs and FETs for switching and amplifier circuits.

- 2. Design and analyze amplifiers and oscillators with different circuit configurations and biasing conditions.
- 3. Understand the feedback topologies and approximations in the design of amplifiers and oscillators.
- 4. Design of circuits using linear ICs for wide range applications such as ADC, DAC, filters and timers.
- 5. Understand the power electronic device components and its functions for basic power electronic circuits.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The IPCC means the practical portion integrated with the theory of the course. CIE marks for the theory componentare **25 marks** and that for the practical component is **25 marks**.

CIE for the theory component of the IPCC

25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

• Scaled-down marks of the sum of two tests and other assessment methods will be CIE

marks for the theory component of IPCC (that is for 25 marks).

• The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva- voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write- ups are added and scaled down to **15 marks**.
- The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question

papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.

- 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- 4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will

have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

- The minimum marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum marks-25) in the theory component and 10 (40% of maximum marks -25) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 sub-questions are to be set from the practical component of IPCC, the total marks of all questions should not be more than 20 marks.
- 2. SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.
- 3. The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Suggested Learning Resources:

Books

1. Albert Malvino, David J Bates, Electronic Principles, 7th Edition, Mc Graw Hill Education, 2017, ISBN:978-0-07-063424-4.

Microelectronic Circuits, Theory and Applications, Adel S Sedra, Kenneth C Smith, 6thEdition, Oxford, 2015.ISBN:978-0-19-808913-1

Web links and Video Lectures (e-Resources):

- Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman, Christos C. Halkias, McGraw-Hill, 2015.
- 2. Electronic Devices and Circuit, Boylestad & Nashelsky, Eleventh Edition, Pearson, January 2015.

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Course Articulation Matrix:

Course Outcomes		POs											PSOs		
	Α	b	c	d	e	f	g	h	i	j	k	1	m	n	0
CO1: Determine currents and voltages using source transformation / mesh/nodal analysis and reduce given network using star delta transformation.	3	2	1	2	1	1	0	1	1	1	1	1	3	0	0
CO2: Solve problems by applying Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions	3	3	1	2	1	1	0	1	1	1	1	1	3	0	0
CO3: Analyze the circuit parameters during switching transients	3	3	1	2	1	1	0	1	1	1	1	1	3	0	0
CO4: Apply Laplace transform to solve the given network	3	2	1	2	1	1	0	1	1	1	1	1	3	0	0
CO5: Evaluate the frequency response for resonant circuits and the network parameters for two port networks	3	2	1	2	1	1	0	1	1	1	1	1			
Course Contribution to POs	3.00	2.4	1	2	1	1	0	1	1	1	0	1	3	0	0

Network	Semester	3					
Course Code	22UEC313C	CIE Marks	50				
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	50				
Total Hours of Pedagogy	40	Total Marks	100				
Credits	03	Exam Hours	3				
Examination type (SEE)	Theory						
Madala 1							

Module-1

Basic Concepts: Practical sources, Source transformations, Network reduction using Star - Delta transformation, Loop and node analysis with linearly dependent and independentsources for DC and AC networks.

Module-2

Network Theorems: Superposition, Millman's theorems, Thevenin's and Norton's theorems, Maximum Power transfer theorem.

Module-3

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

Module-4

Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis.

Module-5

Two port network parameters: Definition of Z, Y, h and Transmission parameters, modeling with these parameters, relationship between parameters sets.

Resonance:

Series Resonance: Variation of Current and Voltage with Frequency, Selectivity and Bandwidth, Q-Factor, Circuit Magnification Factor, Selectivity with Variable Capacitance, Selectivity with Variable Inductance.

Parallel Resonance: Selectivity and Bandwidth, Maximum Impedance Conditions with C, L and f Variable, current in Anti-Resonant Circuit, The General Case-Resistance Present in both Branches.

Course outcomes

At the end of the course, the student will be able to:

- 1. Determine currents and voltages using source transformation / mesh/nodal analysis and reduce given network using star delta transformation.
- 2. Solve problems by applying Network Theorems and electrical laws to reduce circuit and to arrive at feasible solutions.
- 3. Analyze the circuit parameters during switching transients
- 4. Apply Laplace transform to solve the given network
- 5. Evaluate the frequency response for resonant circuits and the network parameters for two port networks

Suggested Learning Resources:Books

- 1. M. E. Van Valkenburg (2000), Network Analysis, Prentice Hall of India, 3rdedition, 2000, ISBN:9780136110958.
- 2. Roy Choudhury-Networks and Systems, 2nd edition, New Age International Publications, 2006,

ISBN: 9788122427677

Reference Books:

- 3. Hayt, Kemmerly and Durbin "Engineering Circuit Analysis", TMH7th Edition, 2010.
- 4. J. David Irwin/ R.Mark Nelms "Basic Engineering Circuit Analysis", John Wiley, 8th Ed, 2006.
- 5. Charles K Alexander and Mathew, N. O. Sadiku- "Fundamentals of Electric Circuits", Tata
- 6. McGraw-Hill, 3rd Ed, 2009.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108105159
- https://nptel.ac.in/courses/108102042
- https://psim.software.informer.com/11.1/
- https://www.ni.com/multisim

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- 1. Demonstrate the operation of the following circuits using suitable simulation software (Open source such as Psim, Pspice, Proteus, Simulink, eSim)
- Determination of current through each branch of a given network using mesh analysis
- Determination of current through each branch of a given network using nodal analysis
- Simplification of given network using source transformation and finding the current in load
- Verification of Superposition, Millman's, Thevenin's and, Maximum Power transfer theorems using practical based approach

Course Articulation Matrix:

Course Outcomes		POs										PSOs			
		b	c	d	e	f	g	h	i	j	k	1	m	n	0
CO1: Determine currents and voltages using source transformation / mesh/nodal analysis and reduce given network using star delta transformation.	3	2	1	2	1	1	0	1	1	1	1	1	3	0	0
CO2: Solve problems by applying Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions	3	3	1	2	1	1	0	1	1	1	1	1	3	0	0
CO3: Analyze the circuit parameters during switching transients	3	3	1	2	1	1	0	1	1	1	1	1	3	0	0
CO4: Apply Laplace transform to solve the given network	3	2	1	2	1	1	0	1	1	1	1	1	3	0	0
CO5: Evaluate the frequency response for resonant circuits and the network parameters for two port networks	3	2	1	2	1	1	0	1	1	1	1	1			
Course Contribution to Pos	3.00	2.4	1	2	1	1	0	1	1	1	0	1	3	0	0

Analog	and Digital System	s Design Laboratory	Semester	3							
Course (Code	22UEC314L	CIE Marks	50							
Teachin (L:T:P:	g Hours/Week S)	0:0:2	SEE Marks	50							
Credits	,	01	Exam Hours	100							
Examina	ation type (SEE)	Practical/Viva-Voc	e								
Course	ourse objectives:										
This la	This laboratory course enables students to										
1. U	1. Understand the electronic circuit schematic and its working										
2. F	. Realize and test amplifier and oscillator circuits for the given specifications										
3. F	Realize the op-amp c	ircuits for the applications such as DAC, implement	t mathematic	al functions							
a	nd precision rectifie	rs.									
4. S	Study the static chara	cteristics of SCR and test the RC triggering circuit.									
5. E	Design and test the co	ombinational and sequential logic circuits for their f	functionalitie	s.							
6. L	Jse the suitable ICs	based on the specifications and functions.									
SI.NO	Experiments (All the experiments has to be conducted using discrete components)										
1	Design and set up the BJT common emitter voltage amplifier with and without feedback and										
	determine the gain- bandwidth product, input and output impedances.										
2	Design and set-up	BJT/FET i) Colpitts Oscillator, ii) Crystal Oscillato	r								
3	Design and set up Comparator	the circuits using op-amp: i) Adder, ii) Integrator, ii	i) Differentia	tor and iv)							
4	Design 4-bit R – 2 switches	R Op-Amp Digital to Analog Converter (i) for a 4	-bit binary in	nput using toggle							
	(ii) by generating of	ligital inputs using mod-16									
5	Design and impler subtractor &	nent (a) Half Adder & Full Adder using basic gates	and NAND	gates, (b) Half							
	Full subtractor using	ng NAND gates, (c) 4-variable function using IC74	151(8:1MUX	.).							
6	Realize (i) Binary conversion	to Gray code conversion & vice-versa (IC74139),	(ii) BCD to	Excess-3 code							
7	and vice versa										
/	a) Realize using N	AND Gates: 1) Master-Slave JK Flip-Flop, ii) D Fl	ip-Flop and i	11) T Flip-Flop b)							
	Realize the shift re	gisters using IC/4/4/495: (1) SISO (11) SIPO (11)	PISO (1V) P	IPO (V) Ring							
	counter and (vi) Jo	phnson									
0	counter.		· -								
0	Realize a) Designb) Mod-N	Mod – N Synchronous Up Counter & Down Cou	inter using 7	476 JK Flip-flop							
	Counter using IC7490 / 7476 c) Synchronous counter using IC74192										

	Demonstration Experiments (For CIE)
9	Design and Test the second order Active Filters and plot the frequency response,
	i) Low pass and High pass Filter
	ii) Band pass and Band stop Filter
10	Design and test the following using 555 timer
	i) Monostable Multivibraator
	ii) Astable Multivibrator
11	Design and Test a Regulated Power supply
12	Design and test an audio amplifier by connecting a microphone input and observe the
	output using a loud speaker.
Course of	outcomes (Course Skill Set):
At the en	nd of the course the student will be able to:
1.	Design and analyze the BJT/FET amplifier and oscillator circuits.
2.	Design and test Op-amp circuits to realize the mathematical computations, DAC and
	precision rectifiers.
3.	Design and test the combinational logic circuits for the given specifications.
4.	Test the sequential logic circuits for the given functionality.

5. Demonstrate the basic circuit experiments using 555 timer.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record writeup. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be valuated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural

knowledge will carry a weightage of 60% and the rest 40% for viva-voce.

- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners) Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- 1. David A Bell, "Fundamentals of Electronic Devices and Circuits Lab Manual", 5th Edition, 2009, OxfordUniversity Press.
- 2. Albert Malvino, David J Bates, Electronic Principles, 7th Edition, Mc Graw Hill Education, 2017.
- 3. Fundamentals of Logic Design, Charles H Roth Jr., Larry L Kinney, Cengage Learning, 7th Edition.

Electr	Semester	3	
Course Code	22UEC315A	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination type (SEE)	Theor	'V	

Course objectives: This course will enable students to:

- 1. Understand the basics of semiconductor physics and electronic devices.
- 2. Describe the mathematical models BJTs and FETs along with the constructional details.
- 3. Understand the construction and working principles of optoelectronic devices
- 4. Understand the fabrication process of semiconductor devices and CMOS process integration.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

These are sample Strategies, which teacher can use to accelerate the attainment of the various courseoutcomes.

- 1. Lecture method(L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Encourage collaborative(Group)Learning in the class.
- 3. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
- 4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- 5. Topics will be introduced in a multiple representation.
- 6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- 7. Discuss how every concept can be applied to the real-world and when that's possible, it helps improve the students' understanding.
- 8. Adopt Flipped class technique by sharing the materials/Sample Videos prior to the class and have discussions on the topic in the succeeding classes.

Module-1

Semiconductors

Bonding forces in solids, Energy bands, Metals, Semiconductors and Insulators, Direct and Indirectsemiconductors, Electrons and Holes, Intrinsic and Extrinsic materials, Conductivity and Mobility, Drift andResistance, Effects of temperature and doping on mobility, Hall Effect. (Text1:3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.2.3, 3.2.4, 3.4.1, 3.4.2, 3.4.3, 3.4.5).

Module-2

PN Junctions:Forward and Reverse biased Junctions-Qualitative description of Current flow at a junction, reverse bias, Reverse bias breakdown- Zener breakdown, avalanche breakdown, Rectifiers. (Text1:5.3.1, 5.3.3, 5.4, 5.4.1, 5.4.2, 5.4.3) Optoelectronic Devices Photodiodes:

Current and Voltage in an Illuminated Junction, Solar Cells, Photodetectors. Light Emitting Diode: Light Emitting materials.

(Text1:8.1.1, 8.1.2, 8.1.3, 8.2, 8.2.1),

Module-3

Bipolar Junction Transistor

Fundamentals of BJT operation, Amplification with BJTS, BJT Fabrication, the coupled Diode model (Ebers-Moll Model), Switching operation of a transistor, Cutoff, saturation, switching cycle, specifications, Drift in the base region, Base narrowing, Avalanche breakdown.

(Text1:7.1, 7.2, 7.3, 7.5.1, 7.6, 7.7.1, 7.7.2, 7.7.3)

Module-4

Field Effect Transistors

Basic p-n JFET Operation, Equivalent Circuit and Frequency Limitations, MOSFET-Two terminal MO S-structure- Energy band diagram, Ideal Capacitance

-Voltage Characteristics and Frequency Effects, Basic MOSFET Operation MOSFET structure, Current-Voltage Characteristics.

(Text2:9.1.1, 9.4, 9.6.1, 9.6.2, 9.7.1, 9.7.2, 9.8.1, 9.8.2).

Module-5 Fabrication of p-n junctions

Thermal Oxidation, Diffusion, Rapid Thermal Processing, Ion implantation, chemical vapour deposition, photolithography, Etching, metallization. (Text 1: 5.1)

Integrated Circuits

Background, Evolution of ICs, CMOS Process Integration, Integration of Other Circuit Elements. (Text 1:9.1, 9.2, 9.3.1, 9.3.3).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

1. Understand the principles of semiconductor Physics

- 2. Understand the principles and characteristics of different types of semiconductor devices
- 3. Understand the fabrication process of semiconductor devices
- 4. Utilize the mathematical models of semiconductor junctions for circuits and systems.
- 5. Identify the mathematical models of MOS transistors for circuits and systems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE)

is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50)

and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The

student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of

100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- 1. There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- 2. Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of

the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks

- 3. Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based thenonly one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at theend of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- 4. The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:Books

- Ben. G. Streetman, Sanjay Kumar Banerjee, "Solid State Electronic Devices", 7thEdition, PearsonEducation, 2016, ISBN978-93-325-5508-2.
- 2. Donald A Neamen, Dhrubes Biswas, "Semiconductor Physics and Devices", 4thEdition, McGraw Hill

Education, 2012, ISBN 978-0-07- 107010-2.

Reference Books:

- 3. S.M. Sze, KwokK.Ng,"PhysicsofSemiconductorDevices", 3rdEdition, Wiley, 2018.
- 4. AdirBar-Lev, "SemiconductorandElectronicDevices", 3rd Edition, PHI, 1993

Sensors and Instr	Semester	3	
Course Code	22UEC315C	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination type (SEE)	Theory		

Course objectives:

- 1. Understand various technologies associated in manufacturing of sensors
- 2. Acquire knowledge about types of sensors used in modern digital systems
- 3. Get acquainted about material properties required to make sensors
- 4. Understand types of instrument errors and circuits for multirange Ammeters and Voltmeters.
- 5. Describe principle of operation of digital measuring instruments and Bridges.
- 6. Understand the operations of transducers and instrumentation amplifiers.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teacher can use to accelerate the attainment of the various courseoutcomes.

1. Lecture method(L) does not mean only traditional lecture method, but different type ofteaching methods may be adopted to develop the outcomes.

- 2. Encourage collaborative(Group)Learning in the class.
- 3. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotescritical thinking.
- 4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recallit.
- 5. Topics will be introduced in a multiple representation.
- 6. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
- 7. Discuss how every concept can be applied to the real-world and when that's possible, it helpsimprove the students' understanding.
- 8. Adopt Flipped class technique by sharing the materials/Sample Videos prior to the class and
- 9. have discussions on the topic in the succeeding classes.

Module-1

Introduction to sensor based measurement systems:

General concepts and terminology, sensor classification, Primary Sensors, material for sensors,

micro sensor technology. (Text 1)

Module-2

Self-generating Sensors-Thermoelectric sensors, piezoelectric sensors, pyroelectric sensors, photovoltaic sensors, electrochemical sensors. (Text 1)

Module-3

Principles of Measurement: Static Characteristics, Error in Measurement, Types of Static Error. (Text2: 1.2-1.6)

Multirange Ammeters, Multirange voltmeter. (Text2:3.2,4.4)

Digital Voltmeter: Ramp Technique, Dual slope integrating Type DVM, Direct Compensation typeand Successive Approximations type DVM (Text 2: 5.1-5.3, 5.5,5.6)

Module-4

Digital Multimeter: Digital Frequency Meter and Digital Measurement of Time, Function Generator. **Bridges:** Measurement of resistance: Wheatstone's Bridge, AC Bridges - Capacitance and Inductance Comparison bridge, Wien's bridge.

(Text2:refer 6.2,6.3 up to 6.3.2, 6.4 up to 6.4.2, 8.8, 11.2, 11.8 -11.10, 11.14).

Module-5

Transducers: Introduction, Electrical Transducer, Resistive Transducer, Resistive position Transducer, Resistance Wire Strain Gauges, Resistance Thermometer, Thermistor, LVDT. (Text2:13.1-13.3,13.5, 13.6 up to 13.6.1,13.7,13.8,13.11).

Instrumentation Amplifier using Transducer Bridge, Temperature indicators using Thermometer, Analog Weight Scale(Text2:14.3.3, 14.4.1, 14.4.3).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Understand the material properties required to make sensors
- 2. Understand the principle of transducers for measuring physical parameters.
- 3. Describe the manufacturing process of sensors
- 4. Analyze the instrument characteristics and errors.
- 5. Describe the principle of operation and develop circuits for multirange Ammeters, Voltmeters and Bridges to measure passive component values and frequency.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam

(SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out

of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of

100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End

Examination) taken together.

Continuous Internal Evaluation:

- 1. There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- 2. Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- 3. Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then onlyone assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at
the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)

4. The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common questionpapers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

"Sensors and Signal Conditioning", Ramon Pallas Areny, JohnG. Webster,2nd edition, John Wiley
 2000

and Sons,2000

2. H.S.Kalsi, "Electronic Instrumentation", Mc Graw Hill, 3rd Edition, 2012, ISBN: 9780070702066.

Reference Books

- David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press PHI 2nd Edition, 2006, ISBN 81-203-2360-2.
- D. HelfrickandW.D. Cooper, "Modern Electronic Instrumentation and MeasuringTechniques", Pearson, 1stEdition, 2015, ISBN: 9789332556065.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Computer Organization	Semester	3		
Course Code	22UEC315B	CIE Marks	50	
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	50	
Total Hours of Pedagogy	40	Total Marks	100	
Credits	03	Exam Hours	3	
Examination type (SEE) Theory				

Course objectives: This course will enable students to:

- 1. Explain the basic sub systems of a computer, their organization, structure and operation.
- 2. Illustrate the concept of programs as sequences of machine instructions.
- 3. Demonstrate different ways of communicating with I/O devices
- 4. Describe memory hierarchy and concept of virtual memory.
- 5. Illustrate organization of simple pipelined processor and other computing systems.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Encourage collaborative (Group) Learning in the class.
- 3. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
- 4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- 5. Topics will be introduced in a multiple representation.
- 6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- 7. Discuss how every concept can be applied to the real world-and when that's possible, it helps improve the students' understanding.
- 8. Adopt Flipped class technique by sharing the materials/Sample Videos prior to the class and have discussions on the topic in the succeeding classes.

Module-1

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance -Processor Clock, Basic Performance Equation(**upto1.6.2ofChap1ofText**).

Machine Instructions and Programs: Numbers, Arithmetic Operations and Characters, IEEE standard for Floating Point Numbers, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing (up to 2.4.6 of Chap 2 and 6.7.1 of Chap 6 of Text).

Module-2

Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks andQueues, Subroutines, Additional Instructions (from 2.4.7 of Chap2, except 2.9.3, 2.11 & 2.12 of Text).

Module-3

Input/ Output Organization: Accessing I/O Devices, Interrupts -Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Direct Memory Access

(up to 4.2.4 and 4.4 except 4.4.1of Chap 4 of Text).

Module-4

Memory System: Basic Concepts, Semiconductor RAM Memories-Internal organization of memory chips, Static memories, Asynchronous DRAMS, Read Only Memories, Cash Memories, Virtual Memories, Secondary Storage Magnetic Hard Disks (5.1, 5.2, 5.2.1, 5.2.2, 5.2.3, 5.3, 5.5 (except 5.5.1 to 5.5.4), 5.7 (except 5.7.1), 5.9, 5.9.1 of Chap 5 of Text).

Module-5

Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hardwired Control, Microprogrammed Control (**up to 7.5 except 7.5.1 to7.5.6 of Chap 7 of Text**).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Explain the basic organization of a computer system.
- 2. Describe the addressing modes, instruction formats and program control statement.
- 3. Explain different ways of accessing an input/ output device including interrupts.
- 4. Illustrate the organization of different types of semiconductor and other secondary storage memories.
- 5. Illustrate simple processor organization based on hard wired control and micro-Programmed control.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE(Semester End Examination) taken together.

Continuous Internal Evaluation:

- 1. There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- 2. Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks

- 3. Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall bescaled down to 25 marks)
- 4. The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

1. The question paper will have ten questions. Each question is set for 20 marks.

There will be 2 questions from each module. Each of the two questions under a module (witha

maximum of 3 sub-questions), should have a mix of topics under that module.

Suggested Learning Resources:

Book

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGrawHill,2002.

Reference Books:

- 2. David A. Patterson, John L. Hennessy: Computer Organization and Design-The Hardware/ Software Interface ARM Edition, 4th Edition, Elsevier, 2009.
- 3. William Stallings: Computer Organization & Architecture, 7th Edition, PHI, 2006.
- 4. Vincent P. Heuring & Harry F. Jordan: Computer Systems Design and Architecture, 2nd Edition, Pearson Education, 2004.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Course Outcomes	Pos										PSOs				
Course Outcomes	a	b	с	d	Ε	f	g	h	i	J	k	l	m	n	0
CO1: Explain the basic organization of a computer system.	2	2	2	1	2	-	-	-	-	-	2	1	2	-	2
CO2: Describe the addressing modes, instruction formats and program control statement.		2	1	1	1	-	-	-	-	-	2	1	1	1	2
CO3: Explain different ways of accessing an input/output device including interrupts.	2	1	2	1	1	-	-	-	1	1	2	1	2	1	1
CO4: Illustrate the organization of different types of semiconductor and other secondarystorage memories	1	2	3	1	3	1	-	-	ļ	1	2	1	2	1	1
CO5: Illustrate simple processor organization based on hard wired control and micro-programmed control.	1	2	2	1	2	-	-	-	-	-	2	1	3	-	1
Course Contribution to POs	1.8	1.8	2	1	1.8	1					2	1	2	1	1.5

Applied Numerical Methods	Semester	3	
Course Code	22UEC315D	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theor	y	•

Course objectives:

- 1. To provide the knowledge and importance of error analysis in engineering problems
- 2. To represent and solve an application problem using a system of linear equations
- 3. Analyze regression **data** to choose the most appropriate model for a situation.
- 4. Familiarize with the ways of solving complicated mathematical problems numerically
- 5. Prepare to solve mathematical models represented by initial or boundary value problems

Teaching-Learning Process Pedagogy

(General Instructions):

These are sample Strategies, teachers can use to accelerate the attainment of the various course outcomes.

- 1. In addition to the traditional lecture method, different innovative teaching methods may be adopted so that the delivered lessons shall develop students' theoretical and applied Mathematical skills.
- 2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
- 3. Support and guide the students for self-study.
- 4. You will assign homework, grading assignments and quizzes, and documenting students' progress.
- 5. Encourage the students to group learning to improve their creative and analytical skills.
- 6. Show short related video lectures in the following ways:
 - i. As an introduction to new topics (pre-lecture activity).
 - ii. As a revision of topics (post-lecture activity).
 - iii. As additional examples (post-lecture activity).
 - iv. As an additional material of challenging topics (pre-and post-lecture activity).
 - v. As a model solution of some exercises (post-lecture activity).

Module-1: Errors in computations and Root of the equations

Approximations and Round Off -Errors in computation: Error definitions, Round-Off errors, Truncation errors and the Taylor series-The Taylor series, Error Propagation, Total numerical error, Absolute, Relative and percentage errors, Blunders, Formulation errors and data uncertainty. Roots of equations: Simple fixed point iteration methods. Secant Method, Muller's method, and Graeffe's Roots Squaring Method. Aitkin's Method. (8 hours)

Module-2: Solution of System of Linear Equations

Rank of the matrix, Echelon form, Linearly dependent and independent equations, Solutions for linear equations, Partition method, Croute's Triangularisation method. Relaxation method. Solution of non-linear simultaneous equations by Newton-Raphson method. Eigen Values and properties, Eigen Vectors, Bounds on Eigen Values, Jacobi's method, Given's method for symmetric matrices. (8 hours)

Module-3: Curve Fitting

Least-Squares Regression: Linear Regressions, Polynomial regressions, Multiple Linear regressions, General Linear Least squares, Nonlinear Regressions, QR Factorization. Curve Fitting with Sinusoidal Functions

Introduction to Splines, Linear Splines, Quadratic Splines, Cubic Splines. Bilinear Interpolation. (8 hours)

Module-4:

Numerical integration, Difference equations and Boundary Value Problems

Romberg's method, Euler-Maclaurin formula, Gaussian integration for n = 2 and n=3. Numerical double integration by trapezoidal and Simpson's 1/3 rd rule. Solution of linear difference equations.

Boundary-Value Problems, Introduction. The Shooting Method, Finite-Difference Methods. (8 hours)

Module-5: Numerical solution of partial differential equations

Classifications of second-order partial differential equations, Finite difference approximations to partial derivatives. Solution of: Laplace equation, Poisson equations, one-dimensional heat equation and wave equations. (8 hours)

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Explain and measure errors in numerical computations
- 2. Test for consistency and solve a system of linear equations.
- 3. Construct a function which closely fits given n-n-points of an unknown function.
- 4. Understand and apply the basic concepts related to solving problems by numerical differentiation and numerical integration.
- 5. Use appropriate numerical methods to study phenomena modelled as partial differential equations.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20marks out of 50) and for the SEE, the minimum passing mark is 35% of the maximum marks(18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the **CIE** (Continuous Internal Evaluation) and **SEE** (Semester End Examination) taken together.

Continuous Internal Evaluation:

- 1. There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- 2. Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks

- 3. Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- 4. The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

The Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books (Name of the author/Title of the Book/Name of the publisher/Edition and Year)Text Books:

- 1. Steven C. Chapra & Raymond P. Canale: "Numerical Methods for Engineers and Scientists", McGraw Hill, 8th Edition, 2020.
- 2. **Steven C. Chapra**: "Applied Numerical Methods with MATLAB for Engineers and Scientists", McGraw Hill, Fifth Edition, 2023.
- 3. **B. S. Grewal**: "Numerical Methods in Engineering & Science with programs in C, C++and MATLAB", Khanna Publishers, 10^hEd., 2015.

Reference Books:

1. John H. Mathews & Kurtis D. Frank: "Numerical Methods Using MATLAB", PHI Publications, 4th Edition, 2005.

Won Young Yang, Wenwu Cao, Tae Sang Chung, John Morris: "Applied Numerical Methods Using MATLAB", WILEY Inter science, Latest Edition, 2005.

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Seminar

	Lab VIEW	Programming	Semester	3			
Course	Code	22UEC316D	CIE Marks	50			
Teachi	ng Hours/Week (L:T:P: S)	0:0:2	SEE Marks	50			
Credits	5	01	Total	100			
			Exam Hours	2			
Examination type (SEE) Practical							
Course	e objectives:						
1.	Aware of various front panel	controls and indicators.					
2.	Connect and manipulate nod	es and wires in the block diagram.					
3.	Locate various tool bars and functions.	pull-down menus for the purpose of in	nplementing specif	fic			
4.	Locate and utilize the contex	t help window.					
5.	Familiar with LabVIEW and	different applications using it.					
Sl.	VI Programs(using LabVIEW software)to realize	the following:				
NO	Basic arithmetic operations	addition subtraction multiplication	and division				
1	Dasic anumetic operations	. addition, subtraction, multiplication a					
2	2 Boolean operations: AND, OR, XOR, NOT and NAND						
3	3 Sum of 'n' numbers using 'for' loop						
4	Factorial of a given number	using 'for' loop					
5	Determine square of a given	n number					
6	Factorial of a given number	using 'while' loop					
7	Sorting even numbers using	g 'while' loop in an array					
8	Finding the array maximum	and array minimum					
		Demonstration Experiments (For CIE)					
9	Build a Virtual Instrument	hat simulates a heating and cooling sy	stem. The system	must be			
	able to be controlled manual	lly or automatically.					
10	Build a Virtual Instrument t	hat simulates a Basic Calculator (usin	g formula node).				
11	Build a Virtual Instrument t	hat simulates a Water Level Detector.					
12	Demonstratehowtocreateab	asicVIwhichcalculatestheareaandperin	neterofacircle.				

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- 1. Use LabVIEW to create data acquisition, analysis and display operations
- 2. Create user interfaces with charts, graph and buttons
- 3. Use the programming structures and data types that exist in LabVIEW
- 4. Use various editing and debugging techniques.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record writeup. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be valuated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between

the schedule mentioned in the academic calendar of the University.

- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

• Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly

by examiners. General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to

be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. Virtual Instrumentation using LABVIEW, Jovitha Jerome, PHI,2011

Virtual Instrumentation using LABVIEW, Sanjay Gupta, Joseph John, TMH, McGraw-Hill, Second Edition, 2011.

MATLAB Programming Semester							
Course Code		CIE Marks	50				
	22UEC316C						
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	50				
Total Hours of Pedagogy	14	Total Marks	100				
Credits	01	Exam Hours	1				
Examination type (SEE)	Theory	,					

Course objectives:

- Understand the MATLAB commands and functions.
- Create and Execute the script and function files
- Work with built in function, saving and loading data and create plots.
- Work with the arrays, matrices, symbolic computations, files and directories.
- Learn MATLAB programming with script, functions and language specific features.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- 1. Adopt Problem Based Learning (PBL), which fosters students' analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recallit.
- 2. Give programming assignments.

Module-1

Introduction: Basics of MATLAB, Simple arithmetic calculations, Creating and working with arrays and numbers.

Module-2

Creating and printing simple plots, Creating, saving and executing a script file, Creating and executing a function file, Working with arrays and matrices.

Module-3

Working with anonymous functions, Symbolic Computations, Importing and exporting data, Working with files and directories.

Module-4

Interactive computations: Matrices and vectors, Matrix and array operations, Character strings, Command line functions, Built-in functions, Saving and loading data, Plotting simple plots.

Module-5

Programming in MATLAB: Script Files, Function Files, Language specific Features.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

- 1. Understand the syntax of MATLAB for arithmetic computations, arrays, matrices.
- 2. Understand the built in function, saving and loading data, and create plots
- 3. Create program using symbolic computations, Importing and exporting data and files
- 4. Create program using character strings, Command line functions and Built-in functions.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

Continuous internal Examination (CIE)

- 1. For the Assignment component of the CIE, there are 25 marks and for the Internal AssessmentTest component, there are 25 marks.
- 2. The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- 3. Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based thenonly one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- 4. For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomyas per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

- 1. The question paper will have ten questions. Each question is set for 10 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module may or may nothave the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
- 3. The students have to answer 5 full questions, selecting one full question from each module.

4. The duration of the examinations shall be defined by the concerned board of studies Suggested Learning Resources: Book

1. Rudra Pratap, Getting Started with MATLAB – A quick Introduction for scientists and Engineers, Oxford University Press, 2010.

Web links and Video Lectures (e-Resources):

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

	C++ Basi	cs	Semester	4				
Course Co	de	22UEC316A	CIE Marks	50				
Teaching I	Hours/Week (L: T:P: S)	0:0:2:0	SEE Marks	50				
Total Hour	rs of Pedagogy	24	Total Marks	100				
Credits		1	Exam Hours	02				
Examination	on nature (SEE)		Practical					
Course ob	jectives:							
• Unders	stand object-oriented program	nming concepts, and apply them	in solving probler	ns.				
• 10 crea	ate, debug and run simple C+	+ programs.	lymorphism and t	function				
overloa	ading.	, mena runetions, inneritance, po	iymorphism and i	lunction				
• Introdu	ice the concepts of exception	handling and multithreading.						
SI. No	Write a C++ program to f	Experiments	argast of three n	umborg using inling				
1	functions MAX & Min	ind largest, smallest & second l	argest of three h	unibers using minite				
2	Write a C++ program to c	alculate the volume of different	geometric shape	s like cube, cylinder				
	and sphere using function o	verloading concept.						
3	Define a STUDENT class	with USN, Name & Marks in 3	tests of a subject	. Declare an array of				
	10 STUDENT objects Using	appropriate functions find the e	variage of the two	hattar marks for anah				
	student Print the USN Na	$x = \frac{1}{2}$ the average marks of all the	e students	Detter marks for each				
4	Write a C++ program to cr	eate class called MATRIX using	g two-dimensiona	al array of integers, by				
	overloading the operator :	== which checks the compatible	tibility of two matrices to be added and					
	subtracted. Perform the ad-	on and subtraction by overloading + and – operators respectively.						
	Display the results by over	loading the operator <<. If (m1	m1 == m2) then $m3 = m1 +$					
	m2 and $m4 = m1 - m2$ else	e display error						
5	Demonstrate simple inheri	tance concept by creating a bas	se class FATHE	R with data members:				
	First Name, Surname, DO	B & bank Balance and creating	g a derived class	SON, which inherits:				
	Surname & Bank Balance	feature from base class but pr	ovides its own f	eature: First Name &				
	DOB. Create & initialize F	1 & S1 objects with appropriat	e constructors &	display the FATHER				
	& SON details							
6	Write a C++ program to d	efine class name FATHER & S	ON that holds the	e income respectively.				
	Calculate & display total ind	come of a family using Friend fun	iction.	1 2				
7	Write a C++ program to ac	cept the student detail such as na	ame & 3 different	marks by get_data ()				
	method & display the name	e & average of marks using disp	lay () method. De	efine a friend function				
	for calculating the average i	narks using the method mark_av	<u>g ().</u>	· · · ·				
8	Write a C++ program to exp which has virtual function	plain virtual function (Polymorph areas two classes rectangle of the	nism) by creating	a base class polygon				
	have area to calculate & ret	urn the area of rectangle & triang	gle respectively.	om porygon & mey				
5 6 7 8	Display the results by over m2 and $m4 = m1 - m2$ else Demonstrate simple inheri <i>First Name, Surname, DO</i> Surname & Bank Balance DOB. Create & initialize F & SON details. Write a C++ program to d Calculate & display total ind Write a C++ program to ac method & display the name for calculating the average F Write a C++ program to ext which has virtual function have area to calculate & ret	loading the operator <<. If (m1 display error tance concept by creating a base <i>B</i> & bank Balance and creating feature from base class but propriat a S1 objects with appropriat effine class name FATHER & S come of a family using Friend fun- cept the student detail such as na e & average of marks using disp marks using the method mark_av- plain virtual function (Polymorph areas two classes rectangle & tri urn the area of rectangle & triang	== m2) then m3 se class FATHEF g a derived class rovides its own f e constructors & ON that holds the action. ame & 3 different lay () method. De g (). hism) by creating riangle derived fre gle respectively.	= m1 + R with data members: SON, which inherits: eature: First Name & display the FATHER e income respectively. marks by get_data () efine a friend function a base class polygon om polygon & they				

9	Design, develop and execute a program in C++ based on the following requirements: An								
	EMPLOYEE class containing data members & members functions: i) Data members: employee								
	number (an integer), Employee_ Name (a string of characters), Basic_ Salary (in integer), All_								
	Allowances (an integer), Net_Salary (an integer). (ii) Member functions: To read the data of an								
	employee, to calculate Net_Salary & to print the values of all the data members. (All_Allowances =								
	123% of Basic, Income Tax (IT) =30% of gross salary (=basic_Salary_All_Allowances_IT).								
10	Write a C++ program with different class related through multiple inheritance & demonstrate the								
	use of different access specified by means of members variables & members functions.								
11	Write a C++ program to create three objects for a class named count object with data members								
	such as roll no & Name. Create a members function set data () for setting the data values &								
	display () member function to display which object has invoked it using "this" pointer.								
12	Write a C++ program to implement exception handling with minimum 5 exceptions classes								
	including two built in exceptions.								
Course ou	tcomes (Course Skill Set):								
At the end	t the end of the course the student will be able to:								

- 1. Write C++ program to solve simple and complex problems
- 2. Apply and implement major object-oriented concepts like message passing, function overloading, operator overloading and inheritance to solve real-world problems.
- 3. Use major C++ features such as Templates for data type independent designs and File I/O to deal with large data set.
- 4. Analyze, design and develop solutions to real-world problems applying OOP concepts of C++

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation (CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio 60:40.

- Each experiment to be evaluated for conduction with observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling the laboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of the semester and the second test shall be conducted after the 14th week of the semester.
- In each test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics suggested in Annexure-II of Regulation book
- The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

SEE marks for the practical course is 50 Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University

All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the questions lot prepared by the internal /external examiners jointly.

Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

The duration of SEE is 03 hours Rubrics suggested in Annexure-II of Regulation book

Suggested Learning Resources:

- 1. Object oriented programming in TURBO C++, Robert Lafore, Galgotia Publications, 2002
- 2. The Complete Reference C++, Herbert Schildt, 4th Edition, Tata McGraw Hill, 2003.
- 3. Object Oriented Programming with C++, E Balaguruswamy, 4th Edition, Tata McGraw Hill, 2006.

IoT for Smar	t Infrastructure	Semester	3
Course Code	22UEC316B	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	14	Total Marks	100
Credits	01	Exam Hours	1
Examination type (SEE)	Theory/Practical		

Course objectives:

To provide an understanding of the concepts, principles, and applications of IoT in the context of smart infrastructure.

To explore the role of IoT technologies in transforming infrastructure into smart, efficient, and sustainable systems and analyze the challenges, opportunities, and considerations in implementingIoT for smart infrastructure.

To examine real-world case studies and successful implementations of IoT in smart cities, buildings, transportation, and energy management and explore future trends and emerging technologies shaping the field of IoT for smart infrastructure.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- **Interactive Lectures:** Conduct interactive lectures to present the theoretical concepts and foundational knowledge of IoT for smart infrastructure.
- **Case Studies and Group Discussions:** Utilize case studies to analyze real-world implementations of IoT in smart infrastructure projects. Divide students into groups and assign them specific cases to discuss and analyze.
- Hands-on Workshops and Simulations: Organize hands-on workshops or simulations where students can interact with IoT devices and technologies relevant to smart infrastructure.
- **Guest Lectures and Industry Experts:** Invite guest speakers or industry experts who have hands-on experience in implementing IoT in smart infrastructure projects. They can share their insights, challenges, and success stories, providing students with a real-world perspective
- **Project-Based Learning:** Assign students to work on individual or group projects related to IoT for smart infrastructure. Provide a project brief with specific objectives and deliverables. Students can apply their knowledge and skills to design, develop, or analyze

IoT solutions for smart infrastructure challenges.

Module-1

Introduction to IoT and Smart Infrastructure

Introduction to IoT: Definition of IoT and its basic components, Overview of IoT applications in various industries, Importance of IoT in transforming infrastructure.

Smart Infrastructure Overview: Introduction to smart infrastructure and its key components, Benefits and challenges of implementing smart infrastructure, Case studies showcasing successful smart infrastructure projects.

IoT Technologies for Smart Infrastructure: Sensors and actuators: Types, functionalities, and applications; Communication protocols: Wi-Fi, Bluetooth, cellular networks, and their use in IoT;

Cloud computing and data analytics in IoT for infrastructure; Edge computing: Real-time decision-making at the edge. Security and Privacy in IoT for Smart Infrastructure: Security challenges and threats in IoT, Privacy considerations and data protection in smart infrastructure, best practices and solutions for ensuring IoT security and privacy.

Module-2

IoT Applications in Smart Cities

Introduction to Smart Cities - Definition and key features of smart cities, Role of IoT in transforming cities into smart cities, Benefits and challenges of smart city implementations. IoT Applications in Smart City Infrastructure - Smart transportation: Intelligent traffic management and transportation systems, Smart buildings: Energy management and occupant comfort; Smart grids: Optimizing energy distribution and consumption; Waste management, water management, and environmental monitoring. Case Studies of Smart City Implementations: Showcase of successful smart city projects around the world; Analysis of the IoT technologies and strategies implemented; Lessons learned from these case studies. Future Trends in Smart Cities: Emerging technologies shaping the future of smart cities, Role of IoT, AI, and 5G in advancing smart city infrastructure, Opportunities and challenges for future smart city developments.

Module-3

IoT Applications in Smart Buildings

Introduction to Smart Buildings: Definition and key features of smart buildings, Benefits of IoTin improving energy efficiency and occupant comfort, Challenges and considerations in implementing smart building technologies. IoT Technologies for Smart Buildings: Building automation systems and controls; Energy management and monitoring using IoT devices; Indoor environmental quality monitoring and optimization; Smart lighting and HVAC systems. Case Studies of Smart Building Implementations: Showcase of successful smart building projects; Analysis of IoT technologies and solutions deployed; Lessons learned from these case studies. Future Trends in Smart Buildings: Emerging technologies for smart buildings; Integration of IoT with AI and machine learning; Potential impact of 5G on smart building applications.

Module-4

IoT Applications in Smart Transportation

Introduction to Smart Transportation: Definition and key features of smart transportation; Role of IoT in intelligent traffic management and transportation systems; Challenges and opportunities in implementing smart transportation solutions. IoT Technologies for Smart Transportation: Traffic sensors and monitoring systems; Intelligent transportation systems (ITS); Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication; Real-time data analysis and predictive analytics.

Case Studies of Smart Transportation Implementations: Showcase of successful smart transportation projects; Analysis of IoT technologies and solutions deployed; Lessons learned from these case studies.

Future Trends in Smart Transportation: Emerging technologies shaping the future of smart transportation; Role of IoT, AI, and autonomous vehicles; Potential impact of 5G on smart transportation applications.

Module-5

IoT for Smart Grids and Energy Management

Introduction to Smart Grids: Definition and key features of smart grids: Role of IoT in optimizing energy distribution and consumption; Benefits and challenges of smart grid implementations. IoT Technologies for Smart Grids: Smart meters and energy monitoring devices; Demand response and load management; Grid optimization and fault detection using IoT; Renewable energy integration and grid stability. Case Studies of Smart Grid Implementations: Showcase of successful smart grid projects, Analysis of IoT technologies and solutions deployed, Lessons learned from these case studies. Future Trends in Smart Grids and Energy Management: Emerging technologies for smart grids;Integration of IoT, AI, and block chain in energy management; Potential impact of 5G on smartgrid applications.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

- Define and explain the core concepts and components of IoT and its relevance to smart infrastructure. Identify and evaluate the key technologies and communication protocols used in IoT for smart infrastructure.
- Assess the benefits, challenges, and ethical considerations associated with implementing IoT in smart infrastructure projects and analyze & compare different IoT applications in smart cities, buildings, transportation, and energy management.
- Examine real-world case studies of successful IoT implementations in smart infrastructure and extract lessons learned. Demonstrate an understanding of security and privacy considerations in IoT for smart infrastructure.
- Discuss the impact of emerging technologies, such as artificial intelligence and 5G, on the future of IoT in smart infrastructure. Apply knowledge and critical thinking skills to propose IoT-based solutions for smart infrastructure challenges.
- Work effectively in teams to analyze, design, and present IoT projects related to smart

infrastructure and communicate effectively and articulate the potential benefits and limitations of IoT for smart infrastructure.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous internal Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (SEE)

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is **01 hour.** The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Web links and Video Lectures (e-Resources): makes.mindmatrix.io

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- 1. Sensor Deployment and Data Collection: Organize a hands-on activity where participants work in groups to deploy sensors in a simulated smart infrastructure environment.
- 2. Smart City Simulation Game: Develop a simulation game where participants take on different roles representing stakeholders in a smart city.
- 3. IoT Solution Design Challenge: Assign participants to design an IoT-based solution for a specific smart infrastructure problem. They can work individually or in teams to identify the problem, propose an IoT solution, outline the required components and technologies, and create a prototype or presentation.
- 4. Security and Privacy Risk Assessment: Conduct a group activity where participants analyse the security and privacy risks associated with IoT deployments in smart infrastructure.

Field Visit to Smart Infrastructure Project: Organize a field visit to a smart infrastructure project, such as a smart building, smart city district, or IoT-enabled transportation system.

SOCIAL CONNECT & RESPONSIBILITIES										
Course Code	21SCR36	CIE Marks	50							
Teaching Hours week (L:T:P:S)	1:0:0	SEE Marks	50							
Total Hours of Pedagogy	15 Total Marks									
Credits	01 Exam Hours 03									
Department	Management Studies	s / Engineering Departme	ent							
Offered for	3 rd Semester									
Prerequisite	Nil									

Objectives: The Course will

- Enable the student to do a deep drive into societal challenges being addressed by NGO(s), social enterprises & The government and build solutions to alleviate these complex social problems through immersion, design & technology.
- Provide a formal platform for students to communicate and connect with their surroundings.
- Enable to create of a responsible connection with society.

Learning Outcomes: The students are expected to have the ability to :

- 1. Understand social responsibility
- 2. Practice sustainability and creativity
- 3. Showcase planning and organizational skills

Contents:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large. The course will engage studentsinr interactive sessions, open mic, reading groups, storytelling sessions, and semester-long activities conducted by faculty mentors. In the following a set of activities planned for the course have been listed :

Module-I

Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.

Module-II

Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.

Module-III

Organic farming and waste management: usefulness of organic farming, wet waste managementin neighboring villages, and implementation in the campus.

Module-IV

Water Conservation: knowing the present practices in the surrounding villages and

implementation in the campus, documentary or photo blog presenting the current practices.

Module-V

Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.

Activities

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersionwith NGOs/social sections will be a key part of the course. Will all lead to the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

A total of 14-20 hrs engagement per semester is required for the 3rd semester of the B.E. /B.Tech. program. The students will be divided into 10 groups of 35 each. Each group will be handled by two **faculty mentors**. Faculty mentors will design the activities (particularly Jammingsessions open mic ,and poetry)

Course Outcomes	Pos										PSOs				
Course Outcomes	a	b	с	d	e	f	g	Η	i	J	k	l	m	n	0
CO1: Understand social responsibility	-	-	-	-	-	-	2	1	3	3	-	3	-	-	-
CO2: Understand Indian culture and history	-	-	-	-	-	-	2	-	1	3	-	3	-	-	-
CO3: Understand smart agriculture	-	-	-	1	-	3	3	-	2	3	3	3	-	-	-
CO4: Practice sustainability and creativity	-	-	-	-	-	3	2	2	2	3	2	3	-	-	-
CO5: Showcase planning and organizational skills	-	-	-	-	-	1	1	-	2	3	-	3	-	-	-
Course Contribution to POs	-	-	-	1	-	2.3	2	1.5	2	3	2.5	3	-	-	-

Faculty mentors has to design the evaluation system.

Guideline forAssessment Process:

Continuous Internal Evaluation (CIE)

After completion of, the social connect, the student shall prepare, with daily **diary** as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

Marks allotted for the diary are out of 50.

Planning and scheduling the social connect

Information/Data collected during the social connect

Analysis of the information/data and report writing

Considering all above points allotting the marks as mentioned below-

Semester End Examination (SEE)

This Jamming session will be conducted at the end of the course for 50 marks

Jamming session includes -Platform to connect to others. Share the stories with others. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art painting, and fine art.

Faculty mentor has to design the evaluation system for the Jamming session.

Excellent	80 to 100
Good	60 to 79
Satisfactory	40 to 59
Unsatisfactoryand fail	<39

Pedagogy (Guidelines) may differ depending on local resources available for the study

Module	Торіс	Content	Group	Location	Magnitude	Activity	Reporting	Evaluation	
I	Plantation and adoption of a tree	Plantation of a tree that will be adopted for four years by a group of B.Tech. students. They will also make an excerpt either as a documentary or a photoblog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.	03-05	Farmers Land or Road side or Community area or institution's campus, any one location to be selected.	One Students must monitor itfor three years	Site selection Select suitable species in consultation with horticulture, forest or agriculture department. Interact with NGO/Industry and community to plant Tag the plant for continuous monitoring	Report shall be hand writtenn or blog with paintings, sketches, poster, video and/or photograph with Geo	Each module is evaluated for 50 Marks and average of all the five modules will be the final marks. CIE Rubrics for 50 M Planning and	
Π	Heritage walk and crafts corner	Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.	03 - 05	Preferably Within the city where institution is located or home town of the student group	One or two One can be a structure or a heritage building theother can be heritage custom or practise	Survey in the form of questioner by connecting to the people and asking. No standard questioner to be given by faculty and has to be evolved involving students. Questions during survey can be asked in local language but report language is English.	tag.	scheduling the social connect – 15 M Information/Da ta collected during the social connect – 15 M Analysis of the information/dat a and report writing – 20 M	
III	Waste management	Wet waste management in neighbouring villages, and implementation in the campus.	03 - 05 More than one group can be	Preferably in the nearby villages and within the campus.	One	Report on importance and benefits of Waste management. Report on segregation, collection, transportation and disposal.		SEE 50 M: Presentation, Jamming session, Open mic, Group	

			assigne d one task based on magnitude of task.			Suggestion for composting. Visit nearby village/location to sensitize farmers and public about waste management and also document current practises.	discussion and debate.
III	Organic farming	Usefulness of organic farming in neighbouring villages, and implementationin the campus.	03 - 05	Visit to farming lands where organic farming is going on Campus Garden Roof top Garden or Vertical Garden or hydroponics if land is scarce.	One	Collect data on organic farming in the vicinity.Like types of crop, methodology etc.,. Suggestion for implementation at selected locations	
IV	Water Conservati on	Knowing the present practices in the surroundingvillages and implementationin the campus, documentaryor photo blog presenting thecurrent practices.	03 - 05	Rain water harvesting demonstration available in the campus or surroundings	One	Visit lakes/pond/river/dry well to involve on rejuvenation activity. Or Assessment of Water budget in the campus/village	

						Report on traditional water conservation practices (to minimize wastage)	
V	Food Walk	City's culinary practices, food lore, and indigenous materials of the region used in cooking.	03 - 05	Within the city where institution is located Food culture of student's resident region	One	Survey local food centres and identify the speciality Identify and study the food ingredients Report on the regional foods Report on Medicinals values of the local food grains, and plants.	

**Important recommendations requested; Special Appreciation from institution and university for students who take care of plants for three years.

IV Sem Syllabus

ELECTROMAGNETIC THEORY Semester						
Course Code		CIE Marks	50			
	22UEC410C					
Teaching Hours/Week (L:T:P: S)	3:0:0	SEE Marks	50			
Total Hours of Pedagogy	40	Total Marks	100			
Credits	03	Exam Hours	03			
Examination type (SEE)	THEORY					

Course objectives:

This course will enable students to:

- 1. Study the different coordinate systems, Physical significance of Divergence, Curl and Gradient.
- 2. Understand the applications of Coulomb's law and Gauss law to different charge distributions and the applications of Laplace's and Poisson's Equations to solve real time problems on capacitance of different charge distributions.
- 3. Understand the physical significance of Biot-Savart's, Ampere's Law and Stokes' theorem for different current distributions.
- 4. Infer the effects of magnetic forces, materials and inductance.
- 5. Know the physical interpretation of Maxwell's equations and applications for Plane waves for their behavior in different media.
- 6. Acquire knowledge of Poynting theorem and its application of power flow

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different types of teaching methods may be adopted to develop the outcomes.
- 2. Encourage collaborative (Group) Learning in the class.
- 3. Ask at least three HOTS (Higher Order Thinking) questions in the class, which promotes critical thinking.
- 4. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, and develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- 5. Topics will be introduced in a multiple representation.
- 6. Show the different ways to solve the same problem and encourage the students to come up with creative ways to solve them.
- 7. Discus show every concept can be applied to the real world and when that's possible, it helps improve the student's understanding.
- 8. Adopt the Flipped class technique by sharing the materials/Sample Videos before the class and having discussions on the topic in the succeeding classes.

Module-1

Revision of Vector Calculus – (Text 1: Chapter 1)

Coulomb's Law, Electric Field Intensity and Flux density: Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge, Field due to Sheet of charge, Electric flux density, Numerical Problems. (Text: Chapter 2.1 to 2.5, 3.1)

Module-2

Gauss's Law and Divergence: Gauss 'law, Application of Gauss' law to Point Charge, line charge, Surface charge and Volume Charge, Point (differential) form of Gauss law, Divergence. Maxwell's First Equation (Electrostatics), Vector Operator ▼ and divergence theorem, Numerical Problems (Text: Chapter 3.2 to 3.7). Energy expended or work done in moving a point charge in an Electric field, The line integral ((Text: Chapter 4.1 and 4.2) Current and Current density, Continuity of current. (Text: Chapter 5.1, 5.2)

Module-3

Poisson's and Laplace's Equations: Derivation of Poisson's and Laplace's Equations, Examples of the solution of Laplace's equation, Numerical problems on Laplace's equation

(Text: Chapters 7.1 and 7.3)

Steady Magnetic Field: Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density.

(Text: Chapters 8.1 to 8.5)

Module-4

Magnetic Forces: Force on a moving charge, differential current elements, Force between differential current elements, Numerical problems (Text: Chapter 9.1 to 9.3). Magnetic Materials: Magnetization and permeability, Magnetic boundary conditions, the magnetic circuit, problems (Text: Chapter 9.6 to 9.8)

Module-5

Faraday's law of Electromagnetic Induction –Integral form and Point form, Numerical problems. Inconsistency of Ampere's law with continuity equation, displacement current, Conduction current, Derivation of Maxwell's equations in point form, and integral form, Maxwell's equations for different media, Numerical problems (Text: Chapter 10.1 to 10.4) Uniform Plane Wave: Wave propagation in free space, Uniform plane wave, Derivation of plane wave equations from Maxwell's equations, Poynting's Theorem and wave power, Skin

effect or Depth of penetration, Numerical problems. (Text: Chapter 12.1, 12.3, 12.4)

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

- 1. Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume.
- 2. Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem.
- 3. Determine potential and energy with respect to point charge and capacitance using Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations
- 4. Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits.
- 5. Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem

ssessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- 1. There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- 2. Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- 3. Any two assignment methods mentioned in the 22OB2.4, if an assignment is project based thenonly one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at theend of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- 4. The final CIE marks of the course out of 50 will be the sum of the scale down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

Theory SEE will be conducted by the University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- 4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Book:

1. W.H. Hayt and J.A. Buck, —Engineering Electromagnetics, 8th Edition, Tata McGraw-Hill, 2014, ISBN-978-93-392-0327-6.

Reference Books:

- 1. Elements of Electromagnetics Matthew N.O., Sadiku, Oxford University press, 4thEdn.
- 2. Electromagnetic Waves and Radiating systems E. C. Jordan and K.G. Balman, PHI, 2ndEdn.
- 3. Electromagnetics- Joseph Edminister, Schaum Outline Series, McGraw Hill.

4. N. Narayana Rao, -Fundamentals of Electromagnetics for Engineering, Pearson

Web links and Video Lectures (e-Resources):

- NPTEL Video lectures: <u>https://youtu.be/pGdr9WLto4A</u>
- NPTEL Video lectures: <u>https://youtu.be/xn2IpxI991M</u>

ActivityBasedLearning(SuggestedActivitiesinClass)/Practical-Based Learning

- Group Discussion/Quiz
- Demonstration of Electromagnetic concepts.
- Case Study on Medical Imaging devices.

Course Outcomes		Pos								PSOs					
-Course Outcomes	a	B	c	d	Ε	f	g	h	i	J	k	l	m	n	0
CO1: Develop a thorough understanding of different coordinate systems and Evaluate problems on electrostatic force and fields	2	2	3	2	2	-	-	-	-	-	-	2	2	-	-
CO2: Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem.	2	3	2	2	2	1	-	-	1	-	-	2	3	-	-
CO3: Interpret the physical significance of Laplace's equation, Biot-Savart's law, Ampere's law, and Stokes' theorem for evaluating Magnetic field for different current configurations	3	2	3	3	2	1	-	-	-	-	-	2	3	-	1
CO4: Interpret magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits.	2	3	2	2	3	1	-	-	-	-	-	2	3	-	-
CO5: Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves.	3	3	3	3	3	1	3	-	-	-	-	2	2	-	-
Course Contribution to POs	2.4	2.6	2.6	2.4	2.4	1	3	-	-	-	-	2	2.6	-	-

PRINCIPLES O SY	Semester	4	
Course Code		CIE Marks	50
	22UEC411C		
Teaching Hours/Week (L:T:P:	3:0:2:0	SEE Marks	50
S)			
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab	Total Marks	100
	slots		
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory/pract	tical	

Course objectives:

This course will enable students to

- Understand and analyze concepts of Analog Modulation schemes viz; AM, FM
- Design and analyze the electronic circuits for AM and FM modulation and demodulation.
- Understand the concepts of random variable and random process to model communication systems.
- Understand and analyze the concepts of digitization of signals.
- Evolve the concept of SNR in the presence of channel induced noise

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain evolution of communication technologies.
- 3. Encourage collaborative (Group) Learning in the class.
- 4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

6. Show the different ways to solve the same problem and encourage the students to come up with their

own creative ways to solve them.

7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

MODULE-1

Random Variables and Processes: Introduction, Probability, Conditional Probability, Random variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross-correlation functions, Gaussian Process: Gaussian Distribution Function. **[Text 2: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.9]**

MODULE-2

Amplitude Modulation Fundamentals: AM Concepts, Modulation index and Percentage of Modulation, Sidebands and the frequency domain, AM Power, Single Sideband Modulation.
AM Circuits: Amplitude Modulators: Diode Modulator, Transistor Modulator, collector Modulator. Amplitude Demodulators: Diode Detector, Balanced Modulators: Lattice Modulators.
Frequency Division Multiplexing: Transmitter-Multiplexer, Receiver-DE multiplexer.
[Text1: 3.1, 3.2, 3.3, 3.4, 3.5, 4.2, 4.3, 4.4, 10.2]

MODULE-3

Fundamentals of Frequency Modulation: Basic Principles of Frequency Modulation, Principles of Phase Modulation, Modulation index and sidebands, Noise Suppression Effects of FM, Frequency Modulation versus Amplitude Modulation.

FM Circuits: Frequency Modulators: Voltage Controlled Oscillators., Frequency Demodulators: Slope Detectors, Phase Locked Loops.

Communication Receiver: Super heterodyne receiver, Frequency Conversion: Mixing Principles, JFET Mixer. [Text1: 5.1, 5.2, 5.3, 5.4, 5.5, 6.1, 6.3, 9.2, 9.3]

MODULE-4

Digital Representation of Analog Signals: Introduction, Why Digitize Analog Sources? The Sampling process, Pulse Amplitude Modulation, Time-Division Multiplexing, Pulse Position Modulation: Generation and Detection of PPM wave. The Quantization Process. Pulse Code Modulation: Sampling, Quantization, Encoding, line Codes, Differential encoding, Regeneration, Decoding, filtering, multiplexing. [Text2: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.8, 7.9]

MODULE-5

Baseband Transmission of Digital signals: Introduction, Inter symbol Interference, Eye Pattern, Nyquistcriterion for distortion less Transmission, Baseband M-array PAM Transmission.

[Text2: 8.1, 8.4, 8.5, 8.6, 8.7]

Noise: Signal to Noise Ratio, External Noise, Internal Noise, Semiconductor Noise, Expressing Noise Levels, Noisein Cascade Stages. **[Text1:9.5]**

PRACTICAL COMPONENT OF IPCC (*Experiments can be conducted using MATLAB/SCILAB/OCTAVE*)

Sl.	Experiment			
NO	S			
•				
1	Basic Signals and Signal Graphing: a) unit Step, b) Rectangular, c) standard triangle d)			
	sinusoidal and e) Exponential signal.			
2	Illustration of signal representation in time and frequency domains for a rectangular pulse.			
3	Amplitude Modulation and demodulation: Generation and display the relevant signals and its			
	spectrums.			
4	Frequency Modulation and demodulation: Generation and display the relevant signals and its			
	spectrums.			
5	Sampling and reconstruction of low pass signals. Display the signals and its spectrum.			
6	Time Division Multiplexing and DE multiplexing.			
7	PCM Illustration: Sampling, Quantization and Encoding			
--------	---	--	--	--
8	Generate a) NRZ, RZ and Raised cosine pulse, b) Generate and plot eye diagram			
9	Generate the Probability density function of Gaussian distribution function.			
10	Display the signal and its spectrum of an audio signal.			
Cours	Course outcomes (Course Skill Set):			
At the	end of the course, the student will be able to:			
1. Ui	1. Understand the principles of analog communication systems and noise modelling.			
2.Ide	2. Identify the schemes for analog modulation and demodulation and compare their performance.			
3.Des	3. Design of PCM systems through the processes sampling, quantization and encoding.			
4 Des	scribe the ideal condition practical considerations of the signal representation for baseband			

4. Describe the ideal condition, practical considerations of the signal representation for b transmission of digital signals.

5. Identify and associate the random variables and random process in Communication system design. Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The IPCC means the practical portion integrated with the theory of the course. CIE marks for the theory componentare **25 marks** and that for the practical component is **25 marks**. **CIE for the theory component of the IPCC**

- 1. 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- 2. Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).
- 3. The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- 1. **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- 2. On completion of every experiment/program in the laboratory, the students shall be evaluated including viva- voce and marks shall be awarded on the same day.
- 3. The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write- ups are added and scaled down to **15 marks**.
- 4. The laboratory test (duration 02/03 hours) after completion of all the experiments shall be conducted for 50 marks and scaled down to 10 marks.
- 5. Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- 6. The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- 4. Marks scored by the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

- a. The minimum marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum marks-25) in the theory component and 10 (40% of maximum marks -25) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 sub-questions are to be set from the practical component of IPCC, the total marks of all questions should not be more than 20 marks.
- b. SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.
- c. The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken
- d. together.

Suggested Learning Resources:

Books

- 1. Louis E Frenzel, Principles of Electronic Communication Systems, 3rd Edition, Mc Graw Hill Education(India) Private Limited, 2016. ISBN: 978-0-07-066755-6.
- 2. Simon Haykin & Michael Moher, Communication Systems, 5th Edition, John Wiley, India Pvt. Ltd, 2010, ISBN:978-81-265-2151-7.

Reference Books

- 1. B P Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems", Oxford University Press., 4th
- edition, 2010, ISBN: 97801980738002.
- Herbert Taub, Donald L Schilling, Goutam Saha, "Principles of Communication systems", 4th Edition, Mc

Graw Hill Education (India) Private Limited, 2016. ISBN: 978-1-25-902985-1

Web links and Video Lectures (e-Resources):

- 1. Principles of Communication Systems https://nptel.ac.in/courses/108104091
- 2. Communication Engineering <u>https://nptel.ac.in/courses/117102059</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- 1. Assignments and test Knowledge level, Understand Level and Apply level
- 2. Experiential Learning by using free and open source software's SCILAB or OCTAVE
- 3. Open ended questions by faculty, Open ended questions from students

Control Systems				
Course Code	22UEC412C	CIE Marks	50	
Teaching Hours/Week (L: T: P)	(3:0:2)	SEE Marks	50	
Total Hours of Pedagogy	40 hours Theory + 12 Lab slots	Total Marks	100	
Credits	04	Exam Hours	03	

Course objectives: This course will enable students to:

- 1. Understand basics of control systems and design mathematical models using block diagram reduction, SFG, etc.
- 2. Understand Time domain and Frequency domain analysis.
- 3. Analyze the stability of a system from the transfer function
- 4. Familiarize with the State Space Model of the system.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type ofteaching methods may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain the different concepts of Linear Algebra & SignalProcessing.
- 3. Encourage collaborative (Group) Learning in the class.
- 4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotescritical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather thansimply recall it.
- 6. Topics will be introduced in a multiple representation.
- 7. Show the different ways to solve the same problem and encourage the students to come upwith their own creative ways to solve them.
- 8. Discuss how every concept can be applied to the real world and when that's possible, ithelps improve the students' understanding.
- 9. Adopt Flipped class technique by sharing the materials / Sample Videos prior to the class and have discussions on the that topic in the succeeding classes.
- 10. Give Programming Assignments.

Module-1

Introduction to Control Systems: Types of Control Systems, Effect of Feedback Systems, Differential equation of Physical Systems -Mechanical Systems, Electrical Systems, Analogous Systems. (Textbook 1: Chapter 1.1, 2.2)

Module-2

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra and Signal Flow graphs. (Textbook 1: Chapter 2.4, 2.5, 2.6)

Module-3

Time Response of feedback control systems: Standard test signals, Unit step response of First and Second Order Systems. Time response specifications, Time response specifications of second order systems, steady state errors and error constants. Introduction to PI, PD and PID Controllers (excluding design). (Textbook 1: Chapter 5.3, 5.4, 5.5)

Module-4

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh stability criterion, Relative stability analysis: more on the Routh stability criterion.

Introduction to Root-Locus Techniques, The root locus concepts, Construction of root loci. (Textbook 1: Chapter 6.1, 6.2, 6.4, 6.5, 7.1, 7.2, 7.3)

Module-5

Frequency domain analysis and stability: Correlation between time and frequency response, Bode Plots, Experimental determination of transfer function. (Textbook 1: Chapter 4: 8.1, 8.2, 8.4) Mathematical preliminaries, Nyquist Stability criterion, (Stability criteria related to polar plots are excluded) (Textbook 1: 9.2, 9.3)

State Variable Analysis: Introduction to state variable analysis: Concepts of state, state variable and state models. State model for Linear continuous –Time systems, solution of state equations. (Textbook 1: 12.2, 12.3, 12.6)

PRACTICAL COMPONENT OF IPCC

Using suitable simulation software (P-Spice/ MATLAB / Python / Scilab / OCTAVE / LabVIEW) demonstrate the operation of the following circuits:

Sl.	Experiments
No.	
1	Implement Block diagram reduction technique to obtain transfer function a control system.
2	Implement Signal Flow graph to obtain transfer function a control system.
3	Simulation of poles and zeros of a transfer function.
4	Implement time response specification of a second order Under damped System, for different
	damping factors.
5	Implement frequency response of a second order System.
6	Implement frequency response of a lead lag compensator.
7	Analyze the stability of the given system using Routh stability criterion.
8	Analyze the stability of the given system using Root locus.
9	Analyze the stability of the given system using Bode plots.
10	Analyze the stability of the given system using Nyquist plot.
11	Obtain the time response from state model of a system.
12	Implement PI and PD Controllers.
13	Implement a PID Controller and hence realize an Error Detector.
14	Demonstrate the effect of PI, PD and PID controller on the system response.

Course Outcomes

At the end of the course the student will be able to:

- 1. Deduce transfer function of a given physical system, from differential equation representation or Block Diagram representation and SFG representation.
- 2. Calculate time response specifications and analyze the stability of the system.
- 3. Draw and analyze the effect of gain on system behavior using root loci.
- 4. Perform frequency response Analysis and find the stability of the system.
- 5. Represent State model of the system and find the time response of the system.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam(SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together

CIE for the theory component of IPCC

Two Tests each of 20 Marks (duration 01 hour)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of **10 Marks**

- First assignment at the end of 4th week of the semester
- Second assignment at the end of 9th week of the semester

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for **30 marks**.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The **15 marks** are for conducting the experiment and preparation of the laboratory record, the other **05 marks shall be for the test** conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 03 hours) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks.
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **20 marks**.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (duration 03 hours)

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under thatmodule.
- The students have to answer 5 full questions, selecting one full question from eachmodule.

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component.

• The minimum marks to be secured in CIE to appear for SEE shall be the 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than the 20 marks.

SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify in the SEE. Marks secured out of 100 shall be reduced proportionally to 50.

Suggested Learning Resources:

Text Books

1. Control Systems Engineering, I J Nagrath, M. Gopal, New age international Publishers, Fifthedition.

Web links and Video Lectures (e-Resources):

• https://nptel.ac.in/courses/108106098

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Programming Assignments / Mini Projects can be given to improve programming skills

	Communication Laboratory	Semester	4	
Course Code	22UEC413C	CIE Marks	50	
Teaching	0:0:2	SEE Marks	50	
Hours/Week				
(L:T:P: S)				
Credits	01	Exam Hours	03	
Examination	Practical			
ype (SEE)				
Course obje	ctives:			
This laborate	bry course enables students to			
1. Understa	nd the basic concepts of AM and FM modulation and der	nodulation.		
2. Design a	and analyze the electronic circuits used for AM and FM r	nodulation and demodu	ilation	
circuits.	1.4 1.4 1.1	1 1		
3. Understa	nd the sampling theory and design circuits which enable	sampling and reconstru	iction of	
analog s	lignais.		ation	
4. Design (electronic circuits to perform pulse amplitude modulation	i, pulse position modul	ation	
and puis				
	Experiments (Experiments to be conduct	ed using hardware		
	components)			
1 Design and test a high-level collector Modulator circuit and Demodulation the signal			signal	
	using diode detector.			
2	Test the Balanced Modulator / Lattice Modulator (Diode	ring)		
3	Design a Frequency modulator using VCO and FM dem	odulator using PLL (Us	se IC56	
	and IC565).			
4	Design and plot the frequency response of Pre-emphasis	and De-emphasis Circ	uits	
5	Design and test BJT/FET Mixer			
6	Design and test Pulse sampling, flat top sampling and re-	Design and test Pulse sampling, flat top sampling and reconstruction		
7	Design and test Pulse amplitude modulation and demodulation.			
8	Generation and Detection of Pulse position Modulation			
9	Generation and Detection of Pulse Width Modulation			
10	PLL Frequency Synthesizer			
11	Data formatting and Line Code Generation			
12	PCM Multiplexer and DE multiplexer			

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- 1. Illustrate the AM generation and detection using suitable electronic circuits.
- 2. Design of FM circuits for modulation, demodulation and noise suppression.
- 3. Design and test the sampling, Multiplexing and pulse modulation techniques using electronic hardware.
- 4. Design and Demonstrate the electronic circuits used for RF transmitters and receivers.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record writeup. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be valuated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.

• Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.

The minimum duration of SEE is 02 hours

Suggested Learning Resources:

1. Louis E Frenzel, Principles of Electronic Communication Systems, 3rd Edition, Mc Graw Hill Education (India) Private Limited, 2016. ISBN: 978-0-07-066755-6.

MICR	Semester	4	
Course Code	22UEC414B	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination type(SEE)	Theory		

Course objectives:

This course will enable students to:

- Understand the difference between Microprocessor and Microcontroller and embedded microcontrollers.
- Analyze the basic architecture of 8051microcontroller.
- Program 8051 microcontroller using Assembly Language and C.
- Understand the operation and use of inbuilt Timers/Counters and Serial port of 8051

• Understand the interrupt structure of 8051 and Interfacing I/O devices using I/O ports of 8051.

Teaching-Learning Process (General Instructions)

The samples strategies, which the teacher can use to accelerate the attainment of the variouscourse outcomes are listed in the following:

- 1. Lecture method (L) does not mean only the traditional lecture method, but adifferent type of teaching method may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain the functioning of various techniques.
- 3. Encourage collaborative(Group)Learning in the class
- 4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical kills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- 6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world and when that's possible, it helps improve the students' understanding. Give Programming Assignments.

Module-1(8Hrs)

Microcontroller: Microprocessor Vs Microcontroller, Micro controller & Embedded Processors, Processor Architectures-Harvard Vs Princeton & RISC Vs CISC, 8051 Architecture- Registers, Pin diagram, I/Oports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing. (Text book 1-1.1,Text book 2-1.0,1.1,3.0,3.1,3.2,3.3 Textbook 3-Pg 5-9)

Module-2(8Hrs)

Instruction Set: 8051 Addressing Modes, Data Transfer Instructions, Arithmetic instructions, Logical Instructions, Jump & Call Instructions Stack & Subroutine Instructions of 8051 (with examples in assembly Language). (Text book 2- Chapter 5,6,7,8, Additional reading Refer Textbook 3, Chapter 3 for complete understanding of instructions with flow diagrams)

Module-3(8Hrs)

Timers/Counters & Serial port programming:

Basics of Timers & Counters, Data types & Time delay in the 8051 using C, Programming 8051 Timers, Mode 1 & Mode 2 Programming, Counter Programming (Assembly Language only). (Text book 2- 3.4, Text book 1- 7.1, 9.1,9.2) Basics of Serial Communication, 8051 Connection to RS232, Programming the 8051 to transfer data serially & to receive data serially using C.(Text book 2- 3.5, Text

book 1- 10.1,10.2,10.3 except assembly language programs, 10.5)

Module-4(8Hrs)

Interrupt Programming: Basics of Interrupts, 8051 Interrupts, Programming Timer Interrupts, Programming Serial Communication Interrupts, Interrupt Priority in 8051(Assembly Language only) (Text book 2- 3.6, Text book 1- 11.1,11.2,11.4, 11.5)

Module-5(8Hrs)

I/O Port Interfacing & Programming: I/O Programming in 8051 C, LCD interfacing, DAC 0808 Interfacing, ADC 0804 interfacing, Stepper motor interfacing, DC motor control & Pulse Width Modulation (PWM) using C only. (Text book 1- 7.2, 12.1, 13.1, 13.2, 17.2, 17.3)

Course outcome (Course Skill Set)

At the end of the course, students will be able to:

- 1. Describe the difference between Microprocessor and Microcontroller, Types of Processor Architectures and Architecture of 8051Microcontroller.
- 2. Discuss the types of 8051 Microcontroller Addressing modes & Instructions with Assembly Language Programs.
- 3. Explain the programming operation of Timers/Counters and Serial port of 8051 Microcontroller.
- 4. Illustrate the Interrupt Structure of 8051 Microcontroller & its programming.
- 5. Develop C programs to interface I/O devices with 8051 Microcontroller.

.Continuous Internal Evaluation:

There are 25marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.

Each test shall be conducted for 25marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks

- 1. Any two assignment methods mentioned in the 22OB2.4, if an assignment is projectbased then only one assignment for the courses hall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- 2. The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's

taxonomy as per the outcome defined for the course.Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common questionpapers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20marks.
- 2. There will be 2questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

TEXT BOOKS

- 1. The "8051 Microcontroller and Embedded Systems Using Assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollind. Mckinlay; Phi, 2006 / Pearson, 2006.
- 2. "The 8051 Microcontroller", Kenneth j. Ayala, 3rd edition, Thomson/Cengage Learning.
- 3. "Programming And Customizing The 8051 Microcontroller"., Myke Predko Tata

Mc Graw-Hill Edition 1999 (reprint 2003).

REFERENCEBOOKS:

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.

"Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

Web links and Video Lectures(e-Resources):

https://youtu.be/pA6K5NgWTow?si=zQqqgXQq50dVL_-s

Industrial	Semester	IV	
Course Code	22UEC414C	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40 hours	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory		

Course objectives: This course will enable student to

- Explain broad types of industrial power devices, there structure, and its characteristics.
- Design and analyze the broad categories of power electronic circuits.
- Explain various types of MEMs devices, principle of operation and construction.
- Familiarize with soft core processors and computer architecture.
- Apply protective methods for devices and circuits.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain evolution of communication technologies.
- 3. Encourage collaborative (Group) Learning in the class.
- 4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills

such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

- 6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- 7. Discuss how every concept can be applied to the real world and when that's possible, it helps improve the students' understanding.

Module-1

Industrial Power Devices: General purpose power diodes, fast recovery power diodes, schottky power diodes, silicon carbide power diodes (**Text book 1: 2.5, 2.6**), Power MOSFETs, Steady state characteristics, switching characteristics, silicon carbide MOSFETs, COOLMOS, Junction field effect transistors, operation and characteristics of JFETs, Silicon Carbide JFET structures, Bipolar Junction Transistors, Steady state characteristics, switching characteristics, silicon carbide BJTs, IGBT, silicon carbide IGBTs

(Text book 1: 4.3, 4.4, 4.6, 4.7

Module-2

Power Electronics Circuits:), Thyristor, Thyristor characteristics, two transistor model (**Text book 1: 9.2, 9.3, 9.4**). Controlled Rectifiers – Single phase full converter with R and RL load, Single phase dual converters, and Three phase full converter with RL load (**Text book 1: 10.2**,

10.3, 10.4). Switching mode regulators – Buck Regulator, Boost regulator, Buck – Boost regulator, comparison of regulators.

(Text book 1: 5.9.1, 5.9.2, 5.9.3, 5.10)

Module-3

Inverters – Principle of operation, Single phase bridge inverter, Three phase inverter with 180 and 120 degree conduction, Current source inverter (**Text book 1: 6.3, 6.4, 6.5, 6.9**).

AC voltage controllers – Single phase full wave controller with resistive load, single phase full wave controller with inductive load (**Text book 1: 11.3, 11.4**).

Module-4

MEMS Devices: Sensing and Measuring Principles, Capacitive Sensing, Resistive Sensing, Piezoelectric Sensing, Thermal Transducers, Optical Sensors, Magnetic Sensors, MEMS Actuation Principles, Electrostatic Actuation, Thermal Actuation, Piezoelectric Actuation, Magnetic Actuation, MEMS Devices Inertial Sensors, Pressure Sensors, Radio Frequency MEMS: Capacitive Switches and Phase Shifters, Microfluidic Components, Optical Devices. (**Text book 2: 13.1, 13.3, 13.4**)

MEMS Applications: Introduction, Industrial, Automotive, Biomedical.

(Text book 2:15.1, 15.2, 15.3, 15.4)

Module-5

Protections of Devices and Circuits: Cooling and Heat sinks, Thermal Modeling of Power Switching Devices, Electrical Equivalent Thermal model, Mathematical Thermal Equivalent Circuit, Coupling of Electrical and Thermal Components, Snubber circuits, Voltage protection by Selenium Diodes and Metal oxide Varistors, Current protection, Fusing, Fault current with AC source, Fault current with DC source, Electromagnetic Interference, sources of EMI, Minimizing EMI Generation, EMI shielding, EMI standards.

(Text book 1: 17.2, 17.3, 17.4, 17.5, 17.6, 17.7, 17.8, 17.9).

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Explain different types of industrial power devices such as MOSFET, BJT, IGBT etc, therestructure, and its operating characteristics.
- 2. Design and analyze the power electronic circuits such as switch mode regulators, inverters, controlled rectifiers and ac voltage controllers.
- 3. Explain various types of MEMs devices used for sensing pressure, temperature, current, voltage, humidity, vibration etc...
- 4. Familiarize with soft core processors such as ASIC and FPGA.
- 5. Familiarize with computer hardware, software, architecture, instruction set, memory organization, multiprocessor architecture.
- 6. Apply protective methods for devices various industrial power devices based on thermal requirements and develop protective methods for the circuits against various electrical parameters.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- □ There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- □ Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- □ Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based thenonly one assignment for the course shall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks)
- □ The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomyas per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
- 3. The students have to answer 5 full questions, selecting one full question from each module.
- 4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Text Books

- 1. Power Electronics: Devices, Circuits, and Applications, Muhammad H. Rashid, Pearson, 4th International edition.
- 2. Fundamentals of Industrial Electronics, Bogdan M. Wilamowski, J. David Irwin, CRC Press, 2011,

Reference Books

- 1. Thomas E. Kissell, Industrial Electronics: Applications for Programmable Controllers, Instrumentation and Process Control, and Electrical Machines and Motor Controls, 3rd edition, 2003, Prentice Hall.
- 2. Ned Mohan, T.M. Undeland and W.P. Robbins, "Power Electronics: Converters, Applications and Design",

Wiley India Ltd, 2008.

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/108/102/108102145/
- https://nptel.ac.in/courses/117105082
- <u>https://www.youtube.com/channel/UCKg8GNii0Q-ieXE56AXosGg/featured</u>
- <u>https://www.ieee-ies.org/</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

• Quiz and Seminars

OPERATING SYSTEM Semester			
Course Code	22UEC414D	CIE Marks	50
Teaching Hours/Week(L:T:P)	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	3
Examination type(SEE)	Theory		

Course objectives:

This course will enable students to:

- Understand the services provided by an operating system.
- Explain how processes are synchronized and scheduled.
- Understand different approaches of memory management and virtual memory management. Describe the structure and organization of the file system
- Understand inter-process communication and deadlock situations.

Teaching-Learning Process (General Instructions)

The samples strategies, which the teacher can use to accelerate the attainment of the variouscourse outcomes are listed in the following:

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.

2. Use of Video/Animation to explain functioning of various concepts.

3. Encourage collaborative (Group Learning) Learning in the class.

4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

6. Introduce Topics in manifold representations.

7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1			
Introduction to Operating Systems: OS, Goals of an OS, Operation of an OS, Computational			
Structures, Resource allocation techniques, Efficiency, System			
Performance and User Convenience, Classes operating System, Batch processing, Multi			
programming, Time Sharing Systems, Real Time and distributed Operating Systems (Topics from			
Sections 1.2, 1.3, 2.2 to 2.8 of Text).			
Madula 2			

Process Management: OS View of Processes, PCB, Fundamental State Transitions of aprocess, Threads, Kernel and User level Threads, Non-preemptive scheduling- FCFS andSRN, Preemptive Scheduling- RR and LCN, Scheduling in Unix and Scheduling in Linux(**Topics from Sections 3.3, 3.3.1 to 3.3.4, 3.4, 3.4.1, 3.4.2, Selected scheduling topics from 4.2 and 4.3, 4.6, 4.7 of Text).**

Module-3

Memory Management: Contiguous Memory allocation, Non-Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, Virtual Memory Management, Demand Paging, VM handler, FIFO, LRU page replacement policies, Virtual memory in Unix and Linux. (**Topics from Sections 5.5 to 5.9, 6.1 to 6.3 except Optimal policy and 6.3.1, 6.7,6.8 of Text**)

Module-4

File Systems: File systems and IOCS, File Operations, File Organizations, Directory structures, File Protection, Interface between File system and IOCS, Allocation of disk space, Implementing file access.

(Topics from Sections 7.1 to 7.8 of Text).

Module5

Message Passing and Deadlocks: Overview of Message Passing, implementing message passing, Mailboxes, Deadlocks, Deadlocks in resource allocation, Handling deadlocks, Deadlock detection algorithm, Deadlock Prevention (**Topics from Sections 10.1 to 10.3, 11.1 to 11.5 of Text**).

Course outcome (Course Skill Set)

At the end of the course, students will be able to:

- 1. Explain the goals, structure, operation and types of operating systems.
- 2. Apply scheduling techniques to find performance factors.
- 3. Explain organization of file systems and IOCS.
- 4. Apply suitable techniques for contiguous and non-contiguous memory allocation.
- 5. Describe message passing, deadlock detection and prevention methods.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks(20marks out

of 50) and forthe SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out

of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

There are 25marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.

Each test shall be conducted for 25marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of thesyllabus. The average of the two tests shall be scaled down to 25 marks

Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the courses hall be planned. The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the sum of the two assignments shall be scaled down to 25 marks) The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of

Blo

om's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question

papers for the course (duration 03 hours).

- 1. The question paper will have ten questions. Each question is set for 20marks.
- 2. There will be 2questions from each module. Each of the two questions under a module (with amaximum of 3 sub-questions), **should have a mix of topics** under that module.

3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources: TEXT BOOKS

E	Semester	IV	
Course Code		CIE Marks	50
	22UEC414A		
Teaching Hours/Week (L:	3:0:0:0	SEE Marks	50
T:P: S)			
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination nature (SEE)	Theory		

COURSE OVERVIEW:

COURSE OBJECTIVES:

The objectives of this course are to:

- 1. Develop proficiency in designing and implementing fundamental data structures.
- 2. Learn various sorting and searching algorithms and analyze their time complexity.
- 3. Understand algorithmic problem-solving techniques, including recursion.
- 4. Explore advanced data structures like trees, graphs, and hash tables.
- 5. Apply data structures and algorithms knowledge to solve real-world programming challengesefficiently.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. The lecturer's approach (L) does not have to be limited to traditional methods of teaching. It is possible to incorporate alternative and effective teaching methods to achieve the desired outcomes.

2. Utilize videos and animations to illustrate the functioning of different techniques used in themanufacturing of smart materials.

3. Foster collaborative learning exercises within the classroom to encourage group participation and engagement.

4. Pose a minimum of three Higher Order Thinking (HOT) questions during class discussions to stimulate critical thinking among students.

5. Implement Problem-Based Learning (PBL) as an approach that enhances students' analyticalskills and nurtures their ability to design, evaluate, generalize, and analyze information rather than calculate relating on rate memorization.

information, rather than solely relying on rote memorization.

Module-1

Arrays:1D,2D and multidimensional.

Pointers: Definition and Concepts, Array of pointers, Structures and unions. Array of structures, pointer arrays, pointer to structures. Passing pointer variable as parameter in functions Dynamic memory allocation: malloc (), calloc (), realloc () and free function. Introduction to data structures and algorithms

Text book 1 -Chapter-1.1-1.3 except Rational Numbers. Text Book 2, chapter-2

Module-2

The Stack – Definition and examples, primitive operations, Example. Representing Stacks in C, Example: Infix, Postfix and Prefix, converting an Expression from Infix to Prefix and Program.

Text Book -1-Chapter – 2.1-2.3

Recursion - Recursive Definition and Processes, Recursion in C, Writing Recursive

Programs.Recursions - Text Book -1-Chapter - 3.1-3.3

Module-3

Queues and Lists – The Queue and its sequential representation, Linked Lists, Lists in C.

Other Lists structures – Circular Lists, Stacks, Queues as circular list. The Josephus problem, doublylinked lists.

Linked lists and Queues - Text Book -1-Chapter – 4.1-4.3, 4.5

Module-4

Trees – Binary Trees, binary tree representations, Huffman algorithm, Trees and their applications.

Searching – Basic searching Techniques, Tree Searching.

Trees - Text Book -1-Chapter - 5.1-5.3, 5.5, 7.1, 7.2

Module-5

Hashing – Introduction, Static Hashing, Dynamic HashingText Book 3 -8.1 – 8.3

Graphs - Graph representation, Elementary graph operations, Minimum cost spanning Trees –Kruskal's Algorithm, Prim's algorithm Text Book 3 - 6.1, 6.2, 6.3.1, 6.3.2

Course Outcomes (COs) (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Master the implementation and application of key data structures in programming.
- 2. Demonstrate the ability to analyze algorithm efficiency and optimize code.
- 3. Solve complex problems by applying algorithmic strategies and techniques.
- 4. Design and implement algorithms for tasks involving searching, sorting, and graph traversal.
- 5. Utilize data structures and algorithms to enhance software performance and scalability

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal AssessmentTest component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and thesecond test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is projectbased then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination (SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question

papers for the course (duration 03 hours).

- 1. The question paper will have ten questions. Each question is set for 20 marks.
- 2. There will be 2 questions from each module. Each of the two questions under a module

(with a maximum of 3 sub-questions), **should have a mix of topics** under that module.

Suggested Learning Resources:

TEXT BOOKS:

- 1. Data Structures using C and C++, Yedidyah, Augenstein, Tannenbaum, 2nd Edition, PearsonEducation, 2007.
- 2. Data Structures using C, Reema Thareja, 2nd Edition, Oxford University Press, 2011
- 3. Fundamentals of Data structures in C, 2nd Edition, Horowitz, Sahni, Anderson freedUniversities Press,2008

REFERENCEBOOKS:

- 1. Reema Thareja, Computer fundamentals and programming in C, second edition, OxfordUniversity Press.
- 2. Gilberg and Forouzan, Data Structures: A Pseudo-code approach with C, 2ndEd,CengageLearning,2014.

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/106/102/106102064/
- https://archive.nptel.ac.in/courses/106/106/106106127/
- <u>https://nptel.ac.in/courses/106102064</u>
- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS35.html
- https://nptel.ac.in/courses/106/105/106105171/
- http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html
- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html
- https://nptel.ac.in/courses/106/101/106101060/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning Real world problem solving using group discussion.

- Back/Forward stacks on browsers.
 - Undo/Redo stacks in Excel or Word.
 - Linked list representation of real-world queues -Music player, image viewer
- Real world problem solving and puzzles using group discussion. E.g., Fake coin identification, Peasant, wolf, goat, cabbage puzzle, Konigsberg bridge puzzle etc.,
 - Demonstration of solution to a problem through programming.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation(CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record/journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record writeup. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling thelaboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up willbeevaluatedfor10marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-upon time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted

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	Micro	ocontrollers	Semester	4
		Lab		
Course	e Code	22UEC415D	CIE Marks	50
Teach	ing Hours/Week(L:T:P)	0:0:2	SEE Marks	50
Credit	TS S	01	Total Marks	100
			Exam	2
			Hours	
Exami	ination type(SEE)	Practical		
Course	e objectives: This course wil	l enable students to:		
• U	Inderstand the basic programmer	ning of Microcontrollers.		
• D	Developthe8051 Microcontrol	ler-based programs for various application	ons using Asse	mbly
L	anguage & CProgramming.			
• P	rogram8051Microcontrollert	ocontrolanexternalhardwareusingsuitable	eI/Oports.	
Note	Execute the following experi	riments by using Keil Microvision Simul	ator (any 8051	-
	Microcontroller			
	can be chosen as the target)	and Hardware Interfacing Programs using	g 8051 Trainer	·Kit.
Sl.No	I. Asso	embly Language Programming		
Data T	ransfer Programs:			
1	Write an ALP to move a l	block of n bytes of data from source (2	0h) to destina	tion (40h)
	usingInternal-RAM.			
2	Write an ALP to move a block of n bytes of data from source (2000h) to destination (2050h)			
	using			
	External RAM.			
3	Write an ALP to exchange	the source block starting with address 20)h, (Internal R	AM)
	containing			
	N (05) bytes of data with de	stination block starting with address 40h	(Internal RAM	[).
4	Write an ALP to exchange t	he source block starting with address 10h	(Internal men	nory),
	containingn (06) bytes of da	ta with destination block starting at locat	ion 00h (Exter	nal
	memory).			
Arithn	netic & Logical Operation I	Programs:		
	Write an ALP to add the by	te in the RAM at 34h and 35h, store the	result in the r	egister R5
5	(LSB)and R6 (MSB), using	Indirect Addressing Mode.		
6	Write an ALP to subtract th	e bytes in Internal RAM 34h &35h store	the result in r	egister R5
	(LSB)			
	& R6 (MSB).			
7	Write an ALP to multiply tw	vo 8-bit numbers stored at 30h and 31h ar	nd store16- bit	result in
	32h and			
	55h of Internal KAM.		1	
8	write an ALP to perform di	vision operation on 8-bit number by 8-bit	number.	
9	write an ALP to separate po	ositive and negative in a given array.		
10	Write an ALP to separate ev	en or odd elements in a given array.		
11	Write an ALP to arrange the	numbers in Ascending & Descending or	der.	

12 Write an ALP to find Largest & Smallest number from a given array starting from 20h & store it in

Internal Memory location 40h.

Counter Operation Programs:

- 13 Write an ALP for Decimal UP-Counter.
- 14 Write an ALP for Decimal DOWN-Counter.
- 15 Write an ALP for Hexadecimal UP-Counter.
- 16 Write an ALP for Hexadecimal DOWN-Counter.
 - II. C Programming
- 1 Write an 8051 C program to find the sum of first 10 Integer Numbers.
- 2 Write an 8051 C program to find Factorial of a given number.
- 3 Write an 8051 C program to find the Square of a number (1 to 10) using Look-Up Table.
- 4 Write an 8051 C program to count the number of Ones and Zeros in two consecutive memory
- locations.
- III. Hardware Interfacing Programs
- 1 Write an 8051 C Program to rotate stepper motor in Clock & Anti-Clockwise direction.

2 Write an 8051 C program to Generate Sine & Square waveforms using DAC interface.

- Course outcomes (Course Skill Set): At the end of the course the student will be able to:
- 1. Write a Assembly Language / C program using 8051 for solving simple problems that manipulate input data using different instructions.
- 2. Develop Testing and experimental procedures on 8051 Microcontroller, Analyze their operationunder different cases.
- 3. Developprogramsfor8051Microcontrollertoimplementreal world problems.
- $4. \quad Develop Microcontroller application susing external hardware interface.$

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and forthe SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ courseif the student secures a minimum of40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

CIEmarksforthepracticalcourseare50Marks.

The split-up of CIE marks for record/journalandtestareintheratio60:40.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up.Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10marks.
- Total marks scored by the students are scaled down to **30marks**(60% of maximum marks).
- Weightagetobegivenforneatnessandsubmissionofrecord/write-upontime.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write- up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20marks** (40% of the maximum marks). The Sum of scaled-down marks scored in the report write-up /journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation(SEE):

- SEE marks for the practical courseare50Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.
- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE are mentioned here, writeup-20%, Conduction procedure and result in -60%, Viva- voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners) Change of experiment is allowed only once and

15% of Marksallotted to the procedure part are to be made zero. The minimum duration of SEE is 02 hours

Suggested Learning Resources:

"The 8051 Microcontroller: Hardware, Software and Applications", V Udayashankara and M S

Mallikarjuna Swamy, McGraw Hill Education, 1 edition, 2017.

PROGRAMMABL	Semester	IV	
Course Code	22UEC415B	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	14 to 16 hours	Total Marks	100
Credits	01	Exam Hours	01
Examination type (SEE)	Theory		

Course objectives: This course will enable student to

- To understand the need for automation in the industry with basic controller mechanisms involved.
- To study programming concepts to achieve the desired goal or to define the various steps involved in the automation.
- To understand programming involved with basic subroutine functions.
- To make use of the internal hardware circuits of automation circuit to control the devices during various states by monitoring the timers and counters.
- To handle the data of the I/O devices to interface the data with the controller and auxiliary devices.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- 1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.
- 2. Show Video/animation films to explain evolution of communication technologies.
- 3. Encourage collaborative (Group) Learning in the class.
- 4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.
- 5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills

such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

- 6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- 7. Discuss how every concept can be applied to the real world and when that's possible, it helps improve the students' understanding.

Module-1

Introduction: Programmable logic controller (PLC), role in automation (SCADA), advantages and disadvantages, hardware, internal architecture, sourcing and sinking (Textbook 1: 1.1 to 1.4)
I/O devices and Processing: list of input and output devices, examples of applications. I/O processing, input/output units, signal conditioning, remote connections, networks, processing inputs I/O addresses.

(TextBook1: 2.1 to 2.3 and 4.1 to 4.7).

Module-2

Programming: Ladder programming- ladder diagrams, logic functions, latching, multiple outputs, entering programs, functional blocks, program examples like location of stop and emergency switches. (**TextBook1: 5.1 to 5.7**).

Module-3

Programming Methods: Instruction Lists- Ladder programs and Instruction lists, Branch codes, Programming Examples- Signal lamp-valve operation task. Sequential Function Charts- Branching and convergence. (**TextBook1: 6.1 to 6.3**).

Module-4

Internal Relays: ladder programs, battery-backed relays, one-shot operation, set and reset, master control relay (**TextBook1: 7.1 to 7.6**).

Timers and counters: Types of timers, ON and OFF- delay timers, pulse timers, forms of counter, programming, up and down counters. (**TexBook1: 9.1 to 9.6**).

Module-5

Shift register and data handling: shift registers, ladder programs, registers and bits, data handling, arithmetic functions. (TextBook1: 11.1 to 11.2 and 12.1 to 12.3)

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

- 1. Describe the PLC and how to construct PLC ladder diagrams.
- 2. Illustrate an application with programming.
- 3. Describe characteristics of registers and conversion examples.
- 4. Apply PLC functions to timing and counting applications.
- 5. Analyze the analog operation of PLC and demonstrate the robot applications with PLC.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- There are 25 marks for the CIE's Assignment component and 25 for the Internal Assessment Test component.
- Each test shall be conducted for 25 marks. The first test will be administered after 40-50% of the coverage of the syllabus, and the second test will be administered after 85-90% of the coverage of the syllabus. The average of the two tests shall be scaled down to 25 marks
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned.
- The schedule for assignments shall be planned properly by the course teacher. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Each assignment shall be conducted for 25 marks. (If two assignments are conducted then the

sum of the two assignments shall be scaled down to 25 marks)

• The final CIE marks of the course out of 50 will be the sum of the scale-down marks of tests and assignment/s marks.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy

as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 01 hours**).

- 1. SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions).
- 2. The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

Suggested Learning Resources:

Textbooks:

- 1. Programmable Logic Controllers-W Bolton, 5th edition/6th edition, Elsevier- newness, 2009/2015.
- 2. Programmable logic controllers principles and applications"-John W. Webb, Ronald A Reiss, Pearsoneducation, 5th edition, 2007.

Reference Books:

- 1 Programmable Logic Controllers"- E. A Paar, 3rd Edition, An Engineers Guide. Newness, 2003.
- 2 "Introduction to Programmable Logic Controller"- Garry Dunning, 3rd Edition, Thomson Asia Pte Ltd. Publication, 2006
- 3 "PLCs & SCADA Theory and Practice"- Rajesh Mehra, Vikrant Vij, 2nd Edition, Laxmi publication, 2017

4 "PLC Programming for Industrial Automation"- Kevin Collins, 1st Edition, Kindle, 2016

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning.

• Quiz and Seminars

Octave Programming				
Course Code	22UEC415A	CIE Marks	50	
Teaching Hours/Week (L:T:P:S)	0:0:2	SEE Marks	50	
Total Hours of Pedagogy	12 Sessions	Total	100	
Credits	01	Exam Hours	02	

*Additional One hour may be considered for instructions ifrequired

Course objectives:

Sl..NO

- Apply theoretical knowledge of Octave programming to practical programming tasks.
- Gain hands-on experience in implementing and debugging octave Programming through codingexercises and projects.

Course Syllabus: Basic data structures in Octave – Vectors, Matrices, Cell Arrays. Special vecors. Linear sampling and logarithmic sampling. Accessing elements of vectors, matrices, and matrices. Mathematical operations on vectors and matrices. Addition, Multiplication, Subtraction, Division, Power, Square-Root, trigonometric operations. Dot Products and Cross Products of Vectors. Matrix multiplication, matrix inverse and matrixtranspose operations. Finding eigen values and vectors of a square matrix. Finding the solution of a system of linear equations. Linear programming and integer linear programming using glpk. Plotting in Octave. Subplots, Stem Plots, Semilog and Log-log plots. Packages in Matlab – symbolic, signal processing, control. Applications of Octave to solve problems in Electrical engineering, Electronics engineering, Control Systems, Signals and Systems/Signal Processing.

Experiments

1 (a) Define the following matrices using Octave i. A 4x4 identity matrix ii. A 4x4 matrix of zeros iii. A 4x4 matrix of ones iv. The matrix U4 defined below. 2 3 1 1 3 2 4 4 v. Matrix D4 defined below. It is also called the Hadamard matrix of dimension 4. 1 1 1 1 -1 1 -1 1 1 -1 -1 1 -1 -1 vi. Matrix H4 defined below $\mathbf{H}_{4} = \frac{1}{\sqrt{4}} \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ \sqrt{2} & -\sqrt{2} & 0 & 0 \end{bmatrix}$ vii. A 4x4 magic square G4 viii. A 4x4 matrix of random numbers selected from the range $\{-1,0,1\}$. ix. A 4x4 matrix of random numbers in the range 0 to 1. (b) (i) How can you generate a 4x4 matrix of all 2's? (ii) Find the transpose of U4. (iii) Multiply D4 by its transpose and obtain the resulting matrix. How is

	 related to the identify matrix? (iv) Find the inverse of H4 and verify that it is the inverse. (v) What is the determinant of D4? (vi) Extract the diagonal elements of H4. (vii) How can you reshape the elements of D4 into a 2x8 matrix? (viii) What is the magic sum of a 4x4 matrix? How can you verify that G4 is indeed a magic square? (ix) The matrix D4 mentioned above is a 4x4 matrix. We wish to extract the sub- matrix consisting of rows 1 and 4 and columns 1 and 4. [In other words, the four corners of D4.) Show Octave code for generating the submatrix SM. (x) Check if the H4 and D4 are orthogonal matrices.
2	 You will have learnt Kirchhoff's current and voltage laws to solve the voltages and currents in a DC circuit. Given a circuit with n loops, we can write down n equations in n unknowns (loop currents). Alternately, given a circuit with n nodes, we can write down n equations in n unknowns (node voltages). These linear equations can be solved using Octave. (a) Write down the KCL and KVL for the following circuit and solve the node voltages and currents. Assume that Vs is 100V. (b) Find the total power dissipated in the circuit. (c) Find the total power supplied by the voltage source. (d) Challenge – Instead of hardcoding the values of the resistors and the voltage source, can you allow the user to input R1, R2, R3, R4, R5, and Vs? Develop a complete Octave script which reads in the values of circuit parameters and prints the node voltages, node currents, and power dissipation. (e) Variations of the above exercises can be given to the students. For example, a resistor can be included in series with Vs. Alternately, a different circuit from a text book can be given. You can also change the problem by specifying the current through one of the resistors and asking the user to solve for Vs.



Assessment Details (both CIE and SEE)
The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam
(SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20
marks). A student shall be deemed to have satisfied the academic requirements and earned the
credits allotted to each course. The student has to secure not less than 35% (18 Marks out of
50) in the semester-end examination (SEE)
Continuous Internal Evaluation (CIE).
CIE marks for the practical course is 50 Marks
The split up of CIE marks for record/journal and test are in the ratio 60:40
First and record for and test are in the facto 00.40 .
• Each experiment to be evaluated for conduction with observation sheet and record
write-up. Rubrics for the evaluation of the journal/write-up for hardware/software
experiments designed by the faculty who is handling the laboratory session and is
made known to students at the beginning of the practical session.
Record should contain all the specified experiments in the syllabus and each experiment
write-up willbeevaluatedfor10marks.
• Total marks scored by the students are scaled downed to 30 marks (60% of maximum
marks).
• Weightage to be given for neatness and submission of record/write-upon time.
• Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the
8 th
week of the semester and these test shall be conducted after the 14 th week of the semester.
• In each test, write-up, conduction of experiment, acceptable result, and procedural
knowledge willcarry a weightage of 60% and the rest 40% for viva-voce.
• The suitable rubrics can be designed to evaluate each student's performance and learning
ability
Rubrics suggested in Annexure-II of Regulation book
• The average of 02 tests is scaled down to 20 marks (40% of the maximum marks)
• The Sum of scaled-down marks scored in the report write-up/journal and average marks of
two tests is the total CIF marks scored by the student
Somostor End Evaluation(SEE).
SEE marks for the practical course is 50 Marks
SEE marks for the practical course is solvialks.
appointed by the University All laboratory experiments are to be included for practical
appointed by the Oniversity An laboratory experiments are to be included for practical
(Rubrice) Preakup of more and the instructions printed on the cover nose of the ensure corint
(Rubics) Bleakup of marks and the instructions printed on the cover page of the answer script
to be sufficing adhered to by the examiners. OR based on the course requirement evaluation
Stadents and mile decided jointly by examiners.
Students can pick one question (experiment) from the question slot prepared by the
internal/external examinersjointly. Evaluation of test write-up/ conduction procedure and
result/viva will be conducted jointly by examiners. General rubrics suggested for SEE are
mentioned here, write up-20%, Conduction procedure and result -60%, Viva-voce 20% of
maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks
shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided
by the examiners) Change of experiment is allowed only once and 15% Marks allotted to
the procedure part to be madezero. The duration of SEE is 03hours Rubrics suggested in
Annexure-II of Regulation book

Suggested Learning Resources:
Textbooks:
Dr. P.J.G. Long, Department of Engineering University of Cambridge, "Introduction to Octave,"
can be downloaded from <u>octavetut.pdf (cam.ac.uk)</u>
Data Structures Lab using C

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- 8 Write recursive C Programs for a. Searching an element on a given list of integers using theBinary Search method. b. Solving the Towers of Hanoi problem.
- 9 Write a program to traverse a graph using BFS method.

Write a program to check whether given graph is connected or not using DFS method.

10 Design and develop a program in C that uses Hash Function H:K->L as H(K)=K mod m(reminder method) and implement hashing technique to map a given key K to the addressspace L. Resolve the collision (if any) using linear probing

Note: The students must be encouraged to create Leet code account and work on Leetcode platform to improve the competency.

Course outcomes (Course Skill Set):

At the end of the course the student will be able to:

- Develop proficiency in coding and debugging complex algorithms and data structures.
- Acquire practical problem-solving skills by applying data structures and algorithms to real-world programming challenges.
- Develop a C program to perform arithmetic operation using data structure and operators.
- Understand the concept of graph theory and develop a C program for searching an element.
- Develop a C program to check the given graph is connected using different algorithms.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. The student has to secure not less than 35% (18 Marks out of 50) in the semester-end examination (SEE).

Continuous Internal Evaluation(CIE):

CIE marks for the practical course is **50 Marks**.

The split-up of CIE marks for record / journal and test are in the ratio **60:40**.

- Each experiment to be evaluated for conduction with observation sheet and record writeup. Rubrics for the evaluation of the journal/write-up for hardware/software experiments designed by the faculty who is handling thelaboratory session and is made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up willbeevaluatedfor10marks.
- Total marks scored by the students are scaled downed to 30 marks (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-upon time.
- Department shall conduct 02 tests for 100 marks, the first test shall be conducted after the 8th week of thesemester and these test shall be conducted after the 14thweek of the semester.
- In each test, write-up, conduction of experiment, acceptable result, and procedural knowledge will carry aweightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability. Rubrics

suggested in Annexure-II of Regulation book

• The average of 02 tests is scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and average marks of two tests is the total CIE marksscored by the student.

Semester End Evaluation(SEE):

SEE marks for the practical course is 50Marks.

SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the University All laboratory experiments are to be included for practical examination.

(Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.

Students can pick one question (experiment) from the question slot prepared by the internal/external examiners jointly.Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners. General rubrics suggested for SEE are mentioned here, write up-20%, Conduction procedure and result -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks (however, based on course type, rubrics shall be decided by the examiners)

Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero. The duration of SEE is 03hours

Rubrics suggested in Annexure-II of Regulation book

Suggested Learning Resources:

Textbooks:

- Data Structures using C, Reema Thareja, 2nd Edition, Oxford University Press, 2011
- Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009.Pearson.
- Online Courses:
 - Coursera: "Algorithms" by Princeton University (taught by Robert Sedgewick and Kevin Wayne).
 - edX: "Algorithmic Design and Techniques" (offered by UC San Diego and Higher School of Economics).
- Websites and Online Resources:
 - Geeks for Geeks: Offers a wide range of tutorials, practice problems, and coding challenges related todata structures and algorithms.

Leet Code: Provides coding challenges that are frequently asked in technical interviews and cover a variety of algorithmic concepts.

- Hacker Rank: Offers coding challenges and competitions with a focus on algorithms and data structures.
- Top Coder: Provides algorithmic challenges and competitions for practicing and improving problem-solving skills.
- YouTube Channels:
 - My code school: Offers video tutorials on various data structures and algorithms topics.
 - The Coding Train: Provides interactive coding tutorials on algorithms and data structures.
- Coding Platforms:
 - Code forces: Offers competitive programming challenges to improve algorithmic problem-solving skills. Hackerearth: Provides coding competitions and challenges along with tutorials and practice problems.

PRINCIPLES OF COMMUNICA	ATION SYSTEMS	Semester	4
Course Code	22UEC411C	CIE Marks	50
Teaching Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory +	Total Marks	100
	8-10 Lab slots		
Credits	04	Exam Hours	3
Examination type(SEE)	Theory		

Course objectives:

This course will enable students to

- 1. Understand the concepts of random variable and random process to model communication systems.
- 2. Understand and analyze concepts of Amplitude modulation and demodulation
- 3. Analyze the electronic circuits for FM modulation and demodulation.
- 4. Understand and analyze the concepts of digitization of signals.
- 5. Evolve the concept of SNR in the presence of channel induced noise.

Teaching-Learning Process (General Instructions).

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. Lecture method (L) does not mean only traditional lecture method, but different type of teaching methods may be adopted to develop the outcomes.

2. Show Video/animation films to explain evolution of communication technologies.

3. Encourage collaborative (Group) Learning in the class.

4. Ask at least three HOTS (Higher order Thinking) questions in the class, which promotes critical thinking.

5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

7. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Random Variables and Processes: Introduction, Probability, Conditional Probability, Random variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross–correlation functions, Gaussian Process: Gaussian Distribution Function. [**Text 2: 5.1, 5.2,5.3,5.4,5.5,5.6,5.9**]

RBT: L1, L2

Module-2

Amplitude Modulation Fundamentals: AM Concepts, Modulation index and Percentage of Modulation, Sidebands and the frequency domain, AM Power, Single Sideband Modulation.

AM Circuits: Amplitude Modulators: Diode Modulator, Transistor Modulator, collector Modulator. Amplitude Demodulators: Diode Detector, Balanced Modulators: Lattice Modulators.

Frequency Division Multiplexing: Transmitter-Multiplexer, Receiver-Demultiplexer. [Text1: 3.1, 3.2,3.3,3.4,3.5,4.2,4.3,4.4,10.2] RBT: L1, L2, L3

Module-3

Fundamentals of Frequency Modulation: Basic Principles of Frequency Modulation, Principles of Phase Modulation, Modulation index and sidebands, Noise Suppression Effects of FM, Frequency Modulation versus Amplitude Modulation.

FM Circuits: Frequency Modulators: Voltage Controlled Oscillators. Frequency Demodulators: Slope Detectors, Phase Locked Loops.

Communication Receiver: Super heterodyne receiver, Frequency Conversion: Mixing Principles, JFET Mixer.

[Text1: 5.1,5.2,5.3,5.4,5.5,6.1,6.3,9.2,9.3] RBT: L1, L2, L3

Module-4

Digital Representation of Analog Signals: Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time-Division Multiplexing, Pulse Position Modulation: Generation and Detection of PPM wave. The Quantization Process. Pulse Code Modulation: Sampling, Quantization, Encoding, line Codes, Differential encoding, Regeneration, Decoding, filtering, multiplexing.

[Text2: 7.1,7.2,7.3,7.4,7.5,7.6,7.8,7.9]

RBT: L1,L2,L3

Module-5

Baseband Transmission of Digital signals: Introduction, Intersymbol Interference, Eye Pattern, Nyquist criterion for distortionless Transmission, Baseband M-ary PAM Transmission. **[Text2:8.1,8.4,8.5,8.6,8.7]**

Noise: Signal to Noise Ratio, External Noise, Internal Noise, Semiconductor Noise, Expressing Noise Levels, Noise in Cascade Stages.

[Text1:9.5] RBT:L1,L2,L3 PRACTICAL COMPONENT OF IPCC (Experiments can be conducted using (MATLAB/SCILAB/OCTAVE)

Sl. No.	Experiments
1.	Basic Signals and Signal Graphing: a) unit Step, b) Rectangular, c) standard triangle d) sinusoidal and e) Exponential signal.
2.	Illustration of signal representation in time and frequency domains for a rectangular pulse.
3.	Amplitude Modulation and demodulation: Generation and display the relevant signals and its spectrums.
4.	Frequency Modulation and demodulation: Generation and display the relevant signals and its spectrums.
5.	Sampling and reconstruction of low pass signals. Display the signals and its spectrum.
6.	Time Division Multiplexing and demultiplexing.
7.	PCM Illustration: Sampling, Quantization and Encoding
8.	Generate a)NRZ, RZ and Raised cosine pulse, b) Generate and plot eye diagram
9.	Generate the Probability density function of Gaussian distribution function.
10.	Display the signal and its spectrum of an audio signal.

Course outcomes

At the end of the course, the students will be able to :

- 1. Identify and associate the random variables and random process in Communication system design.
- 2. Identify the schemes for amplitude modulation and demodulation and compare their performance.
- 3. Identify the schemes for frequency modulation and demodulation
- 4. Design of PCM systems through the processes sampling, quantization and encoding.
- 5. Describe the ideal condition, practical considerations of the signal representation for baseband transmission of digital signals and different types of noise.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The IPCC means the practical portion integrated with the theory of the course. CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**. CIE for the theory component of the IPCC

• 25 marks for the theory component are split into 15 marks for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and 10 marks for other assessment methods. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.

• Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks**).

• The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

• 15 marks for the conduction of the experiment and preparation of laboratory record, and 10 marks for the test to be conducted after the completion of all the laboratory sessions.

• On completion of every experiment/program in the laboratory, the students shall be evaluated including viva voce and marks shall be awarded on the same day.

• The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write ups are added and scaled down to **15 marks**.

• The laboratory test (**duration 02/03 hours**) after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks**.

• Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 25 marks.

• The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for **20 marks**.

2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

3. The students have to answer 5 full questions, selecting one full question from each module.

4. Marks scored by the student shall be proportionally scaled down to **50 Marks**

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

• The minimum marks to be secured in CIE to appear for SEE shall be 10 (40% of maximum marks-25) in the theory component and 10 (40% of maximum marks -25) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 04/05 sub-questions are to be set from the practical component of IPCC, the total marks of all questions should not be more than 20 marks.

• SEE will be conducted for 100 marks and students shall secure 35% of the maximum **marks to** qualify for the SEE. Marks secured will be scaled down to 50.

• The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Suggested Learning Resources:

Books

1. Louis E Frenzel, Principles of Electronic Communication Systems, 3rd Edition, Mc Graw Hill Education (India) Private Limited, 2016. ISBN: 978-0-07-066755-6.

2. Simon Haykin & Michael Moher, Communication Systems, 5th Edition, John Wiley, India Pvt. Ltd, 2010, ISBN: 978-81-265-2151-7.

Reference Books

1. B P Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems", Oxford University Press., 4th edition, 2010, ISBN: 97801980738002.

2. Herbert Taub, Donald L Schilling, Goutam Saha, "Principles of Communication

Weblinks and Video Lectures (e-Resources):

- Principles of Communication Systems https://nptel.ac.in/courses/108104091
- Communication Engineering <u>https://nptel.ac.in/courses/117102059</u>

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- 1. Assignments and test Knowledge level, Understand Level and Apply level
- 2. Experiential Learning by using free and open source software's SCILAB or OCTAVE
- 3. Open ended questions by faculty, Open ended questions from students

Course Outcomes		POs											PSOs		
		2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1: Identify and associate the random variables and random process in Communication system design.		3	1	0	1	1	1	0	0	0	0	0	3	0	0
CO2: Identify the schemes for amplitude modulation and demodulation and compare their performance.		2	1	0	1	1	1	0	0	0	0	0	3	0	0
CO3: Identify the schemes for frequency modulation and demodulation		2	1	0	1	1	1	0	0	0	0	0	3	0	0
CO4: Design of PCM systems through the processes sampling, quantization and encoding.		2	1	0	1	1	1	0	0	0	0	0	3	0	0
CO5: Describe the ideal condition, practical considerations of the signal representation for baseband transmission of digital signals and different types of noise		2	1	0	1	1	1	0	0	0	0	0	3	0	0
Course Contribution to POs		2.2	1	0	1	1	1	0	0	0	0	0	3	0	0

Course Articulation Matrix:

POs satisfied by the course

(PO1)Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

(PO2)Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

(PO3) Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

(**PO5**)**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

(**PO6**)**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

(**PO7**)**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PSOs satisfied by the course

PSO1.Analyze and design systems for Electronics, Communication, and Signal Processing Applications.

SEMESTER – IV											
Course Title: SIGNALS	Credits: 03										
CIE Marks: 50	per of Lecture Ho P:S; 3-0-0-0)	ours/Week: 03									
Total Number of Lectu	SEE Examinat	tion Hours: 03									
 Course Learning Objectives: This course will enable students to: Understand mathematical description of continuous and discrete time signals and systems. Analyze LTI systems in time domain using convolution sum and Integral. Classify signals and systems based on their properties. Analyze signals and Linear Time Invariant (LTI) systems in time and transform domains 											
	Mode	ule-1		R B T Level							
Introduction and Class communication and cont Basic Operations on a differentiation, integration Elementary signals/Fur ramp functions. Express terms of elementary sign	L1, L2, L3										
Module-2											
System Classification invariant, causal-non cau Time domain represe convolution sum, convo convolution integral using step and exponential, exand rectangular and recta	Time variant- nvertible. ulse response, olution sum and d unit step, unit and rectangular,	L1, L2, L3									
C	Mod	ule-3									
LTI System Proper interconnection, Memor and step response. Fourier Representation problems.	L1, L2, L3										
	Mod	ule-4									
Fourier Representation Transform & DTFT, Det Properties of Fourier Scaling, Differentiation Parsaval's theorem and p	L1, L2, L3										
The 7 Transforms: 7	Mod	ule-5	of conversions.								
properties of the Z-tran	L1, L2, L3										

Transform analysis of LTI systems.

Course Out comes: At the end of the course, students will be able to:

- **CO-1:** Represent signals mathematically and perform operations on dependent and independent variable of signal.
- **CO-2:** Classify and analyze LTI systems in time domain.
- **CO-3:** Analyze signals in transform domain.
- **CO-4:** Analyze systems in transform domain.

Question Paper Pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 50 marks.

Text Book:

Simon Haykin and Barry VanVeen, "Signal and Systems, 2nd Edition, 2008, ISBN 9971-51-239-4. Wiley Publication

Reference Books:

- 1. **Michael Roberts,** "Fundamentals of Signals & Systems",2nd edition, Tata McGraw-Hill, 2010, ISBN 978-0-07-070221-9.
- 2. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
- 3. H. P. Hsu, R. Ranjan, "Signals and Systems", Scham's out lines, TMH, 2006.
- 4. **B. P. Lathi**, "Linear Systems and Signals", Oxford University Press, 2005.
- 5. Ganesh Rao and Satish Tunga, "Signals and Systems", Pearson/Sanguine.

Course Articulation Matrix

Course Outcomes					P	0						PSO		
		2	3	4	5	6	7	8	9	10	11	1	2	3
CO-1: Represent signals mathematically		2	1									3		
and perform operations on dependent and														
independent variable of signal.														
CO-2: Classify and analyze LTI		3	1									3		
systems in time domain.														
CO-3: Analyze signals in transform		3	1									3		
domain.														
CO-4: Analyze systems in transform	3	2	1									3		
domain.														
Course Contribution to POs	3.0	2.5	1.0									3		