B.V.V.S

Scheme and Syllabus

B.E in Electrical and Electronics Engineering

For 2020-21 Admitted Batch

Department of Electrical and Electronics Engineering
Basaveshwar Engineering College
Bagalkote-587102

B.V.V.S

Vision and Mission of the College

Vision

To be recognized as a premier technical institute committed to developing exemplary professionals, offering research based innovative solutions and inspiring inventions for holistic socio-economic development

Mission

- **To pursue excellence through student centric dynamic teaching-learning processes, encouraging freedom of inquiry and openness to change.**
- **To carry out innovative cutting edge research and transfer technology for industrial and societal needs.**
- **To imbibe moral and ethical values and develop compassionate, humane professionals.**

B.V.V.S

Vision and Mission of the Department

Vision

To be in the global forefront of Academic Excellence, Research, and Innovation in Electrical and Electronics Engineering to influence and meet the energy, environment, industrial and societal needs.

Mission

- **To practice dynamic teaching-learning processes adapting to ongoing global technological developments in the field of Electrical and Electronics Engineering.**
- **To involve ourselves in national/international (industry/institute) collaborations for higher studies, research, development and innovation.**
- **To carryout inter-disciplinary projects, skill development activities and field visits to imbibe real life experiences in students.**
- **To render empathetical services to resolve energy, ecology and environmental issues.**

B.V.V.S

Programme Educational Objectives (PEOs)

After successful completion of the program:

PEO1: **The graduates will be able to pursue professional career**

PEO2: **The graduates will be able to take up higher studies and research**

PEO3: **The graduates will be able to engage in multi-disciplinary innovation and entrepreneurship activities**

PEO4: **The graduates will be able to adopt emerging technologies to provide solutions to the societal and environmental issues**

B.V.V.S

Programme Specific Outcomes (PSOs)

After successful completion of the program:

PSO1: **Specify, formulate and analyze concepts used in power systems and electrical machines as per requirements of power & energy sector**

PSO2: **Identify, analyze, design and test technologies used in power electronics, electronic & signal processing circuits and control systems**

PSO3: **Apply conventional concepts and contemporary tools to design, simulate and analyze electrical and electronic systems for real time applications through hands on learning gained in SCADA, energy systems and power electronics laboratories**

Program Outcomes as defined by NBA (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **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.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **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.

Basaveshwar Engineering College (Autonomous), Bagalkot

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Scheme of Teaching and Evaluation for B.E Electrical and Electronics Engineering based on Joint Board Meeting held on 09.05.2020 and 22.05.2021

2020-21 (admitted batch), 2021-22 (sem 3&4), 2022-23 (sem 5&6), 2023-24 (sem 7&8)

Total Credits for BE =175 (as per VTU/AICTE); Min Cr/sem=16; Max Cr/sem=28; Ave=22

Breakdown of Credits suggested by the VTU Belagavi/ AICTE New Delhi

Sl.	Undergraduate Programme		Current Credits	% allotted by EE	% range as per VTU
1	HSS + Soft skills + UHV-2 + Kannada + English [2X3+1x3+0+1+1]		11	06.3	5-10
2	Basic Sciences		25	14.3	10-20
3	Engg. Sciences		20	11.4	10-20
4	Professional Core Courses Advanced C Programming Lab – 2 credits (Mandatory at VI sem, common for circuit branches)		69	39.4	30-40
5	Dept. Electives		18	10.3	10-15
6	Open Elective at V, VI & VII (3+3+3)		9	05.1	5-10
7	Online course (3)		3	01.7	
8	Mini project (VI) Internship (Min 6 weeks from IV-VI), Registration & Evaluation in -VII) Seminar (VII) Project (VIII)	2 2 1 15	20	11.4	10-15
Total			175	100	100

First Year Course

Subject	Credits	Contact hours
Basic Electrical Engineering	2 (L)+1 (T)	Lectures 2 Hours/week + Tutorial 2 Hours/week

Semester Wise Credit Distribution for Semester-III to VIII

Particulars	Semesters						Total		% of total credits	% range as per VTU
	III	IV	V	VI	VII	VIII				
Core + Lab	16+3	16+3	12+3	6+2+2	6+2	--	71		39.4	30-40
Dept. Electives	--	--	3	3	3	3+3+3	18		10.3	10-15
Open Electives	--	--	3	3	3	--	9		05.1	05-10
Online Course	--	--	--	--	3	--	3		01.7	
Mini Project	--	--	--	2	--	--	2	18	11.0	10-15
Internship	--	--	--	--	2	--	2			
Technical Seminar	--	--	--	--	1	--	1			
Project	--	--	--	--	--	13	13			
HSS + Soft Skills	--	1	1	3+1	3	--	9		05.7	5-10
UHV-2 (Mandatory)	--	--	--	--	--	--	---			
Kannada (HSS)		1					1			
Maths	3	3	--	--	--	--	6			
Total	22	24	22	22	23	22	135			

* additional online course (student's choice)

Semester-I Physics Group (Common to branches EE, EC EI, CS, IS & AI)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UMA161C	Engineering Mathematics -I	4.0	3	2	0	50	50	100
02	UPH162C	Engineering Physics	4.0	3	2	0	50	50	100
03	UEE164C	Basic Electrical Engineering	3.0	2	2	0	50	50	100
04	UCS165C	Programming with C	3.0	3	-	0	50	50	100
05	UEC169C	Basic Electronics	3.0	2	2	0	50	50	100
06	UPH166L	Engineering Physics Laboratory	1.5	0	0	3	50	50	100
07	UCS167L	C Programming Laboratory	1.5	0	0	3	50	50	100
08	UHS126M	Constitution of India*	0	2	0	0	50	50	100
Total			20	15	8	6	400	400	800

Semester-II Chemistry Group (Common to branches EE, EC EI, CS, IS & AI)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UMA261C	Engineering Mathematics -I	4.0	3	2	0	50	50	100
02	UME263C	Elements of Mechanical Engineering	3.0	2	2	0	50	50	100
03	UCH268C	Engineering Chemistry	4.0	3	2	0	50	50	100
04	UCV270C	Engineering Mechanics	3.0	2	2	0	50	50	100
05	UCH272L	Engineering Chemistry Laboratory	1.5	0	0	3	50	50	100
06	UME275L	Computer Aided Engineering Graphics	2.0	0	0	4	50	50	100
07	UBE176L	Basic Engineering Laboratory	1.5	0	0	4	100	-	100
08	UHS177C	English for Engineers	1.0	2	0	0	50	50	100
09	UBT233M	Environmental Studies*	0	2	0	0	50	50	100
Total			20	14	08	11	500	400	900

Semester-3 CAY 2021-22 (175 Credits 2020-21 admitted batch)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UMA391C	Numerical Techniques and Integral Transforms	3	3	0	0	50	50	100
02	UEE351C	Analog and Digital Electronics	4	4	0	0	50	50	100
03	UEE352C	Network Analysis	4	3	2	0	50	50	100
04	UEE353C	Electrical and Electronics Measurements	4	4	0	0	50	50	100
05	UEE354C	Transformers and Induction Machines	4	4	0	0	50	50	100
06	UEE355L	Transformers and Induction Machines Laboratory	1	0	0	2	50	50	100
07	UEE356L	Electrical & Electronic Measurement Laboratory	1	0	0	2	50	50	100
08	UEE357L	Network Analysis Laboratory	1	0	0	2	50	50	100
09	UMA330M	Bridge Course Mathematics-I*	0	3	0	0	50	50	100
10	UBT133M	Environmental Studies**	0	2	0	0	50	50	100
Total			22	23	02	06	550	550	1100

*Bridge Course Mathematics-I	:	is a mandatory subject only for students admitted to 3rd Semester through lateral entry scheme (Diploma quota). Passing the subject is compulsory, however marks will not be considered for awarding grade/class. A PP/NP grade will be awarded for passing/not passing the subject.
**Environmental Studies	:	is a mandatory subject for lateral entry students. Question Paper will be of Objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade / Class / Rank.

Semester-4 CAY 2021-22 (175 Credits 2020-21 admitted batch)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UMA491C	Statistics and Probability distribution	3	3	0	0	50	50	100
02	UEE451C	Signals and Systems	4	3	2	0	50	50	100
03	UEE452C	Power Electronics	4	4	0	0	50	50	100
04	UEE453C	Operational Amplifiers and Linear IC's	4	4	0	0	50	50	100
05	UEE454C	DC Machines and Synchronous Machines	4	4	0	0	50	50	100
06	UEE456L	Power Electronics Laboratory	1	0	0	2	50	50	100
07	UEE457L	DC Machines and Synchronous Machines Laboratory	1	0	0	2	50	50	100
08	UEE458L	Linear IC's Laboratory	1	0	0	2	50	50	100
09	UHS001N	Fundamentals of Quantitative Aptitude & Soft Skills	1	2	0	0	50	50	100
10	UHS488C	Saamskrutika Kannada***	1	2	0	0	50	50	50
		OR							
10	UHS489C	Balake Kannada***	1	2	0	0	50	50	50
11	UMA430M	Bridge Course Mathematics-II*	0	3	0	0	50	50	100
12	UHS226M	Constitution of India**	0	2	0	0	50	50	100
13	UHS004M	Universal Human Values-II	0	3	0	0	50	50	100
Total			24	27	04	06	650	650	1300

*Bridge Course Mathematics –II	:	is a mandatory subject only for students admitted to 4th Semester through lateral entry scheme (Diploma quota). Passing the subject is compulsory, however marks will not be considered for awarding grade /class. A PP/NP grade will be awarded for passing/not passing the subject.
**Constitution of India	:	is a mandatory subject for lateral entry students. Question Paper will be of Objective type. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade / Class /Rank.
***Saamskrutika Kannada ***Balake Kannada	:	Is for students who speak read and write kannada Is for non-kannada speaking reading and writing

Semester-5 CAY 2022-23 (175 Credits 2020-21 admitted batch)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UEE551C	Field Theory	3	2	2	0	50	50	100
02	UEE552C	Digital Signal Processing	3	2	2	0	50	50	100
03	UEE553C	Control Systems	3	2	2	0	50	50	100
04	UEE554C	Generation Transmission and Distribution	3	3	0	0	50	50	100
05	UEE5XXE	Dept. Elective – 1	3	3	0	0	50	50	100
06	UEE5XXN	Open Elective – 1	3	3	0	0	50	50	100
07	UEE561L	Digital Signal Processing Laboratory	1	0	0	2	50	50	100
08	UEE562L	Control System Laboratory	1	0	0	2	50	50	100
09	UEE563L	Analog and Digital Laboratory	1	0	0	2	50	50	100
10	UHS002N	Advanced Quantitative Aptitude and Soft Skills	1	2	0	0	50	50	100
Total			22	20	00	06	500	500	1000

List of Elective Subjects

Fundamentals of Solar Thermal ECS	Electrical Engineering Materials
Electrical Machine Design	**Electrical Engineering Materials**
Testing and Commissioning of Electrical Equipment	**Micro Electro Mechanical Systems**
Advanced Power Electronics	**Reactive Power management**
Fundamentals of Solar Thermal ECS	

List of Open Electives Subjects @ 5th Sem	
Renewable Energy Resources	MATLAB for Engineers

Semester-6 CAY 2022-23 (175 Credits 2020-21 admitted batch)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UEE651C	Power System Analysis and Stability	3	2	2	0	50	50	100
02	UEE652C	Microcontrollers	3	3	0	0	50	50	100
03	UEE653H	Management and Entrepreneurship	3	3	0	0	50	50	100
04	UEE6XXE	Dept. Elective – 2	3	3	0	0	50	50	100
05	UEE6XXN	Open Elective – 2	3	3	0	0	50	50	100
06	UEE661L	Microcontrollers & IoT Laboratory	1	0	0	2	50	50	100
07	UEE662L	Electrical Auto CAD Laboratory	1	0	0	2	50	50	100
08	UEE665P	Mini Project	2	0	0	4	50	50	100
09	UCS659L	Advanced C P Laboratory (mandatory)	2	0	2	2	50	50	100
10	UHS003N	Career Planning and Professional Skills	1	2	0	0	50	50	100
Total			22	20	02	10	550	550	1100

List of Elective Subjects

Modern Control Theory	**VLSI Design and Applications**
Electrical safety in Industrial plants	**Battery Management**
Electrical Power Utilization and Drives	**Energy Efficient Motors**
Fundamentals of Wind Energy Conversion Systems	**Computer aided electrical drawing**

List of Open Electives Subjects @ 6th Sem	
Electric Vehicle	Fundamentals of Wind Energy Conversion Systems

• Universal Human Values-II	:	is a mandatory subject for all EE students admitted to 6th sem. Students have to pass the subject compulsorily, however marks will not be considered for awarding Grade / Class /Rank. A PP/NP grade will be awarded for passing/not passing the subject.

Semester-7 CAY 2023-24 (175 Credits 2020-21 admitted batch)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UEE751C	Computer Applications to Power System	3	3	0	0	50	50	100
02	UEE752C	High Voltage, Switchgear and Protection	3	3	0	0	50	50	100
03	UHS753C	Intellectual Property Rights	3	3	0	0	50	50	100
04	UEE7XXE	Department Elective – 3	3	3	0	0	50	50	100
05	UEE7XXN	Open Elective – 3	3	3	0	0	50	50	100
06	UEE761L	Power System Simulation Laboratory	1	0	0	2	50	50	100
07	UEE762L	High Voltage and Relay Laboratory	1	0	0	2	50	50	100
08	UEE764I	Internship*	2	0	0	*	70	30	100
09	UEE765S	Technical Seminar	1	0	0	2	50	50	100
10	UEEXXXX	MOOCS online course (4/8/12 weeks)	3	0	0	0	0	0	100
Total			23	15	0	04	400	400	900

* Working hours will be as per scheduled working hours prescribed by the industry.

List of Elective Subjects

Electrical Machine Drives	Operation Research
Solar Photovoltaic System Design	Standards and Indian Electricity Act
Professional Communication and Technical Writing	Autotronics (Automotive Electronics)
AI Applications to Power Systems	Embedded System and PLC

List of Open Electives Subjects @ 7th Sem	
Energy conservation in Industrial Systems	Electrical Safety for Engineers

Semester-8 CAY 2023-24 (175 Credits 2020-21 admitted batch)

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UEE8XXE	Dept. Elective – 4	3	3	0	0	50	50	100
02	UEE8XXE	Dept. Elective – 5	3	3	0	0	50	50	100
03	UEE8XXE	Dept. Elective – 6	3	3	0	0	50	50	100
04	UEE871P	Project Work (Industry or Inhouse R&D labs)	13	0	0	26	50	50	100
Total			22	6	0	26	150	150	300

List of Elective Subjects

Power System Operation and Control	Speech Signal processing
Power System Dynamics and Stability	Over Voltages in Power Systems
Data Base management Systems	HVDC Transmission
Energy Conservation, Audit and DSM	Advances in Instrumentation
Flexible AC Transmission Systems	Power System Planning
Digital Control Systems	Smart Grids

Syllabus for

B.E. I/II - Semester

for academic year 2020 – 2021

(For students admitted to I year in 2020-21)

Syllabus for B.E. I / II - Semesters for academic year 2020 – 2021

(For students admitted to I year in 2020-21)

Basic Electrical Engineering

Subject Code: UEE164C/264C	**Credits: 03**
Contact Hours: 04 (2L - 2T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

L-06 Hours, T-07 Hours

Electromagnetism:

- Series and parallel magnetic circuits, Comparison between magnetic and electric circuits.
- Faradays laws, Lenz's law, Fleming's rules, statically and dynamically induced emf, Self and mutual inductance, coefficient of coupling, Energy stored in a magnetic field.

DC Circuits:

- KCL, KVL, Ohm's law, Mesh current and Node voltage Analysis.

Unit-II

L-07 Hours, T-06 Hours

Single Phase AC Circuits:

- Generation of sinusoidal voltages, Phase & phase difference of sinusoidal waveform, J-operator, Voltage and Current Relationships, Instantaneous and Average power in R, L, C, R-L, R-C & R-L-C series circuits, R-L-C Parallel circuits.

Transformer:

- Types, Construction and principle of operation, EMF equation, No load and On load operation, Losses and efficiency.

Unit-III

L-07 Hours, T-06 Hours

Three Phase AC Circuits:

- Generation of three phase AC voltage, Phase sequence, Voltage and Current relationship for star and delta connections, Advantages of three phase supply over single phase.
- Measurement of power using two wattmeters (for balanced load), Expression for power factor in terms of wattmeter readings, Effect of power factor on wattmeter readings.

Generators :

- **DC Generator**: Construction, Principle of operation, emf equation, Types.
- **AC Generator:** Types, Construction, Principle of operation, emf equation excluding Kp & Kd.

Unit-IV

L-07 Hours, T-06 Hours

Motors :

- DC Motor: Principle of operation, Back emf, Mechanical power developed, Torque equation, Types and Applications, Characteristics of motors, Necessity of starters, Three point starter.
- AC Motor: Types, Construction and principle of operation of three phase induction motor, Production of rotating magnetic field, Frequency of rotor current, Slip, Torque equation, Torque slip characteristics, Applications, Star-Delta starter.

Electrical Wiring and Safety:

- Fuses, Necessity of Earthing, Types of Earthing
- Electrical wiring, Calculation of energy consumption and billing

Syllabus for B.E. I / II - Semesters for academic year 2020 – 2021

(For students admitted to I year in 2020-21)

Text Books:

1. B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th Edition, 2008
2. Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010

Reference Books:

1. Rajendra Prasad, "Fundamentals of Electrical Engineering", 2nd Edition, PHI Learning, 2009
2. V.N.Mittle & A.Mittal, "Basic Electrical Engineering", Tata McGraw-Hill Education, 2005
3. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", 2nd Edition, Pearson Publications, 2017

Course outcomes:

After completion of the course, students shall be able to:

- Recall basics of magnetic circuits, electromagnetism, single phase & three phase circuits and electrical earthing
- Illustrate the laws of magnetic & electric circuits, concepts of single phase & three phase AC circuits, Operation of transformer and AC & DC machines, characteristics curves and domestic wiring practices
- Derive the expressions for statically & dynamically induced emf, Self & mutual inductances, power in AC series & parallel circuits
- Develop the emf equations for transformer, DC-AC generators and torque equations of DC motor & induction motors
- Calculate different parameters related to magnetic circuits, DC circuits, single phase & three phase AC circuits, AC & DC machines.
- Apply the laws & theorems of magnetic and electric circuits to analyze & evaluate the circuit parameters

Syllabus for

B.E. III - Semester

for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UMA391C	Numerical Techniques and Integral Transforms	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10 Hours)
Numerical Analysis-I: Introduction to root finding problems, Bisection Method, Newton-Raphson method. Finite differences, forward and backward difference operators (no derivations on relations between operators) Newton-Gregory forward and backward interpolation formulae. (Without proof), Lagrange's and Newton's divided difference interpolation formulae (without proof).	
UNIT – II	**(10 Hours)**
Numerical Analysis-II: Numerical differentiation using Newton's forward and backward formulae-problems. Trapezoidal rule, Simpson's one third rule, Simpson's three eighth rule and Weddle's rule (no derivation of any formulae)-problems. Euler's and Modified Euler's method, Runge-Kutta 4^{th} order method.	
UNIT – III	**(10 Hours)**
Fourier series: Periodic functions, Conditions for Fourier series expansions, Fourier series expansion of continuous and functions having finite number of discontinuities, even and odd functions. Half-range series, practical harmonic analysis.	
UNIT – IV	**(10 Hours)**
Fourier transforms and z-transforms: Infinite Fourier transforms and inverse Fourier transforms- simple properties, Fourier sine and Fourier cosine transforms, Inverse Fourier sine and cosine transforms. Z-transforms-definition, standard forms, linearity property, damping rule, shifting rule-problems.	

Reference Books:

1. Steven Chapra, Raymond Canale, "Numerical Methods for Engineers", 6^{th} Edition, Tata McGraw Hill Publishers, 2018.
2. Dr. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi.
3. H. K. Das, "Advanced Engineering Mathematics", S. Chand & company Ltd. Ram Nagar, New Delhi.
4. E Kreyszig, "Advanced Engineering Mathematics", Wiley & Sons, 10^{th} Edition, 2011.

Course Outcomes:

After completion of the course, the students shall be able to:

1. Solve engineering problems using non-linear equations & Interpolation techniques.
2. Solve problems using numerical differentiation and numerical integration.
3. Capable to perform numerical solutions of ordinary differential equations.
4. Break down a wave into its various frequency components using Fourier transform
5. Understand the basic concepts of Fourier transforms and z –transforms, to solve ode, pde and difference equations.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE351C	Analog and Digital Electronics	04 - Credits (4 : 0 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(13 Hours)
Diode Circuits: Introduction, clipping circuits, Clipping at two independent levels, Clamping Circuits, Comparators, Full wave rectifier with C filter **Transistor Biasing:** Introduction, Operating point, DC load line, Bias stability, voltage divider bias, Derivation of stability factors, Bias compensation.	
UNIT – II	**(13 Hours)**
BJT Low Frequency Analysis: Introduction, two port devices. Hybrid model, transistor hybrid model. h - Parameters, Analysis of transistor amplifier circuit using h- parameters (CE amplifier only) **Multistage Amplifiers& Power Amplifier:** Introduction, Classification of Amplifiers, Frequency response of R-C coupled amplifier, Class A large signals amplifier, Transformer coupled power amplifier, Class B (Push pull) amplifiers **Field Effect Transistor:** Introduction, construction & characteristics of JFETs, transfer characteristics, Important relationships, Depletion &Enhancement type MOSFETs	
UNIT – III	**(13 Hours)**
Number system & Combinational Logic: Number system Definition of combinational logic, canonical forms, Karnaugh maps - 3 and 4 variables, incompletely specified functions (Don't Care terms), simplifying minterm and maxterm equations **Minimization Techniques:** Quine- McClusky minimization technique, Quine- McClusky using Don't Care terms, Map entered variables **Analysis and Design of Combinational Logic** : Adders and subtractors, Cascading full adders, look ahead carry adders, binary comparators, Codes &Code converter.	
UNIT – IV	**(13 Hours)**
Analysis and Design of Combinational Logic: Decoders -BCD Decoders, encoders. Digital multiplexers, multiplexers as Boolean function generators. **Sequential Circuits 1:** Basic bistable element, latches, SR latch, Application of SR latch, gated D latch, Master - Slave SR flip - flops (pulse-triggered flip-flops). Master slave JK flip - flop. Conversion of flip-flop from one type to another **Sequential Circuits 2**: Characteristic equations, registers, counters - binary ripple counters, synchronous binary counters, counter based on shift registers, design of synchronous counters, design of synchronous mod-6 counter using clocked D, T, JK and SR flip- flops	

Reference Books:

1. Boyle stead and Nashelesky, "Electronic Devices and Circuit theory" 11th edition, Pearson, 2013.
2. Jacob Millman and Christos C. Halkias, "Integrated Electronics", TMH, 2010.
3. Albert Malvino and David J Bates, "Electronic Principles", 8th edition, TMH, 2016.
4. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford University Press, 2008.

5. S.Samuel, Mahadevaswamy and V. Nattarasu, "Electronic Circuits", 2nd edition, Sanguine Technical Publishers, 2012.
6. John M Yarbrough, "Digital Logic Application and Design", Cengage Learning India Pvt, Ltd, 2006.
7. Donald D Givone, "Digital Principles and Design", Tata McGraw Hill, 2003

Course Outcomes:

After completion of the course, the students shall be able to:

1. Analyze and explain different types of clipping, clamping and full wave rectifier circuits, and drive expressions for efficiency and ripple factors.
2. Explain different types of biasing circuits, single stage and multistage amplifier, analyze hybrid model and derive h - Parameters.
3. Explain JFET & MOSFET construction and characteristics and drive important relation
4. Simplify boolean algebra equations by using K. map and Quine Mcclusky and MEV techniques.
5. Design combinational circuits like Code converters adders, comparators, decoders, mux etc.
6. Design Flip-Flop, sequential circuit Registers and Counters.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE352C	Network Analysis	04 - Credits (3 : 2 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 65		SEE Marks : 50

UNIT – I	(10L 6T Hours)

Mesh and Node Analysis:

Practical source transformation, network reduction using star delta transformation, Loop and node analysis with linearly dependent and independent source for DC and AC networks. Concept of super node and super mesh- Numerical Problems

Network Topology:

Graph of network, concept of tree and co-tree, incidence matrix, Tie-set & cut-set schedules, Formulation of equilibrium equations in matrix form, solution of resistive network, Principles of duality- Numerical Problems

UNIT – II	(10L 8T Hours)

Network Theorems-I:

Superposition, Reciprocity, and Millman's theorems- Numerical Problems

Network Theorems-II:

Thevenin's, Norton's and Maximum power transfer theorems- Numerical Problems

UNIT – III	(9L 8T Hours)

Resonant Circuits:

Series and parallel resonance, frequency-response of series and parallel circuits, Q-factor, Bandwidth-Numerical Problems

Transient behavior and initial conditions:

Behavior of circuit element under switching condition and their representation, evaluation of initial and final conditions in RL, RC, and RLC circuits for AC and DC excitation- Numerical Problems

UNIT – IV	(10L 6T Hours)

Laplace Transformations and Applications:

Step, Ramp and Impulse functions and their Laplace transformation, Waveform synthesis and Laplace transformation initial value theorem and final value theorem, transformed network and their solution- Numerical Problems

Two port network parameters:

Short Circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationship between parameters sets- Numerical Problems

Reference Books:

1. William H, Jack E Kemmerly and Steve Durbin, "Engineering Circuit Analysis", 8th Edition, Tata McGraw Higher Education, 2013.
2. M.E.VanValkenburg, "Network analysis", 3rd Edition, PHI Learning, 2014.
3. Roy Chowdhary, "Network and Systems", 2nd Edition, New age International Publications, 2010.
4. Charles K. Alexander, Matthew N. O. Sadiku "Fundamentals of Electric Circuits", 5th Edition, Tata McGraw Higher Education, 2013.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

Course Outcomes:

After completion of the course, the students will be able to:

1. List different types of electric circuits and active & passive elements and recall the statements of network theorems
2. Demonstrate source transformation, star-delta conversion, mesh & node analysis, network topology concepts and Laplace transforms in electric circuits
3. Solve eclectic circuits by applying network theorems and Laplace transforms
4. Analyze behavior of R, L & C elements in the electric circuits, their frequency response and determine resonance related parameters
5. Determine and establish the relation between the various parameters in electric circuits
6. Build expressions for mesh currents and node voltages by employing the network topology for solving large power system networks.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE353C	Electrical and Electronics Measurements	04 - Credits (4 : 0 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(13 Hours)
Measurement of Resistance Inductance and Capacitance: (10L- Hours) Measurement of medium resistance: Wheatstone bridge - Sensitivity of WS bridge, Galvanometer current, Limitations; Measurement of low resistance: Different Methods of measuring low resistance, Kelvin's Double bridge; AC Bridges: General equilibrium equations of AC bridges; Measurement of Self Inductance – Types of bridges for measurement of self-inductance, Maxwell's Inductance bridge, Maxwell's Inductance Capacitance Bridge, Anderson's bridge; Measurement of Capacitance: Types of bridges for measurement of capacitance, De Sauty's bridge, Schering Bridge; Errors in bridge circuits, Sources and Detectors.	
UNIT – II	**(13 Hours)**
Measuring Instruments: (5L- Hours) Introduction; Types of Instruments; Permanent Magnet Moving Coil Instrument(PMMC) – Torque equation; Moving Iron Instruments(MI) – Torque equation; Electrodynamometer Type Instruments – Torque equation,; Thermocouple Instruments – Principle of operation, Construction, Advantages and Disadvantages. **Measurement of Power and Related Parameters : (5L- Hours)** Dynamometer Type Wattmeter, Low Power Factor Wattmeter; Induction Type Single Phase Energy meter – Construction, Theory; Dynamometer Type Single Phase Power Factor meter – Construction and Operation; Weston Frequency meter.	
UNIT – III	**(13 Hours)**
Extension of Instrument ranges: (10L- Hours) Introduction; Shunts and Multipliers for AC Ammeter and Voltmeter respectively; Instrument Transformers: Advantages of Instrument Transformers, Ratios of Instrument Transformers, ratio Correction Factor, Burden on Instrument Transformer; Current Transformer (CT) – Theory of CT, Errors in CT's, Design features if CT's; Potential Transformer (PT) – Differences between CT and PT, Theory of PT.	
UNIT – IV	**(13 Hours)**
Sensors and transducers: (10L- Hours) Definition and meaning of sensors and transducers, Difference between sensors and transducers, Classification (Types) of transducers: Mechanical/Electrical, Active/Passive, Analog/Digital, Modulating/Self balancing, Examples and advantages of electrical transducers. Resistive transducers: Potentiometers, RTD, Thermistor, Magneto-resistor (Principle, construction, working and application for each type). Capacitive transducers: Absolute and differential type, applications. Inductive transducers: Synchronous, Linear variable differential transformer (LVDT) ((Principle, construction, working and application). Self-generating (Active) transducers: Piezoelectric, Pyroelectric, Thermocouple (Principle, construction, working and application for each type). Sensor/transducer-based instrumentation system: Generalized block diagram representation, Typical examples related to electrical field.	

Reference Books:

1. Golding & Widdies, Pitman, "Electrical Measurements and Measuring Instruments", 5th edition, D.R & Son's, New Delhi.
2. John P Beately, "Principles of Measurement Systems", 3rd edition, Pearson Education, 2006.
3. Ramon P. Areny, John G. Webster, "Sensors and Signal Conditioning", 2nd Edition, Wiley India Private Ltd.
4. A. K. Sawhney, "Electrical & Electronic Measurements and Instrumentation", 19th edition, Dhanpat Rai & Son's, New Delhi, 2011.
5. Cooper D and A. D. Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", PHI.
6. Ian R. Sinclair, "Sensors and Transducers", 3rd Edition, Newnes Publication.

Course Outcomes:

After completion of the course, the students shall be able to:

1. **list & define** various parameters and features of different types of electrical & electronic measuring instruments/devices, sensors & transducers.
2. **explain** the operation of different types of electrical & electronic measuring instruments/devices, sensors, transducer and their related components.
3. **experiment with or make use** of different types of electrical & electronic measuring instruments/devices, sensors & transducers.
4. **compare and contrast** the features of different types of electrical & electronic measuring instruments/devices, sensors & transducers.
5. **evaluate/calculate** various parameters related to different types of electrical & electronic measuring instruments/devices, sensors & transducers.
6. **discuss/choose/test** different types of electrical & electronic measuring instruments/devices, sensors & transducers.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE354C	Transformers and Induction Machines	04 - Credits (4 : 0 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(13 Hours)
Single Phase Transformer: Transformer construction and types, Principle of operation, emf equation, concept of ideal transformer, no-load and on-load analysis of ideal and practical transformer. Phasor diagrams, Development of equivalent circuit diagram, Calculation of equivalent circuit parameters by OC and SC tests, Transformer ratings and per unit(p.u.) scaling, Types of losses, efficiency, all day efficiency, voltage regulation, polarity test and Sumpner's test	
UNIT – II	**(13 Hours)**
Three Phase Transformer: Types, three phase transformer connections: star-star, star-delta, delta-star, delta-delta, open delta. Choice of connections: bank of single-phase transformers for three phase operations. Scott connection for three phase operations, Scott connection for three phases to two phase conversation. Labeling of three phase transformer terminals, phase shift between primary and secondary and vector groups, Harmonics in transformer, Suppression of harmonics by tertiary winding **Parallel operation of Transformer:** Need for parallel operation, conditions to be satisfied for parallel operation and load sharing, Parallel operation of three phase transformer **Auto Transformer:** Construction, working principle, saving of copper, equivalent circuit and applications	
UNIT – III	**(13 Hours)**
Three Phase Induction Machine: Construction, types-squirrel cage and slip ring motors. Principle of operation, production of rotating magnetic field, slip, rotor induced emf and it's frequency, power losses in an induction motor, equivalent circuit, torque equation, torque-slip characteristics-motoring generating and breaking modes, starting torque, maximum torque, effect of rotor resistances on torque slip -characteristics, power output, no load and blocked rotor test- evaluation of equivalent circuit parameters, circle diagram and obtain it's performance, double cage and deep bar motors, Cogging and crawling	
UNIT – IV	**(13 Hours)**
Starting and Speed Control of Three Phase Induction Motors: Need for starter, DOL, star delta, autotransformer and rotor resistance starters, Calculation of starting torque Voltage control, frequency and rotor resistance control **Single Phase Induction Motors:** Construction, double field revolving theory and principle of operation, equivalent circuit starting of single phase motors: Resistance split phase, capacitor start and capacitor run motors, shaded pole motors	

Reference Books:

1. I. J. Nagarath and D.P Kothari, “Electrical Machines” TMI Publications, 4th - Edition 2012.
2. Ashaq Hussian, “Electrical Machines”, Dhanapatrai and Co. 2nd - Edition 2007.
3. P.S.Bhimra, “Electrical Machinery”, Khanna Publishers, New Delhi, 7th - Edition 2008-2011.
4. Smarjit Ghosh “Electrical Machines” Pearson, 3rd - Edition 2011.
5. P.S.Bhimra, “Generalized Theory of Electrical Machine”, Khanna Publishers, New

Delhi, 5th - Edition2008

6. Alexander Longsdorf, "Theory of alternating current", TMH-Publications 1999

Course Outcomes:

After completion of the course, the students shall be able to:

1. Explain the principle and construction of transformer and their phasor diagram.
2. Draw the equivalent circuit of transformer and calculate the parameters using OC and SC test.
3. Explain the necessary of autotransformer and parallel operation of transformer and their application.
4. Connect three phase transformer and compute different values.
5. State how torque is produced and torque varies with speed for induction motor and compute various electrical and mechanical qualities by no-load and blocked rotor test and circle diagram.
6. Explain starting methods and speed control of single phase and three phase IM and select proper motors for different applications.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE355L	Transformers and Induction Machines Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Open circuit and short circuit test on single phase transformer and pre-determination of efficiency, regulation for different loads at power factors. Calculations of equivalent circuit parameters of a given transformer.
2. Sumpner's test.
3. Parallel operation of two single phase transformers (dissimilar ratings)
4. Connections of three single phase transformers: star-star, star-delta, delta-delta and delta-star.
5. Scott Connection. To convert 3-phase to 2-phase supply
6. Load test on three phase induction motor and performance evaluation, (torque-speed, BHP-efficiency,slip BHP, etc).
7. No-load and blocked rotor test on three phase induction motor to calculate parameters of equivalentcircuit diagram and performance evaluation.
8. No-load and blocked rotor test on three phase induction motor to draw the circle diagram and hencethe performance evaluation of given motor.
9. Speed control of three phase slip ring induction motor by rotor resistance.
10. Load test on single phase induction motor and performance evaluation (torque-speed, BHP- efficiency,slip -BHP, etc)

Course Outcomes:

1. Test the given transformers and induction motors by various methods and predetermine their performance such as losses, efficiency and regulation.
2. Connect the given transformers in different configurations for different operations, like autotransformer, parallel operation and 3-phase connections.
3. Control the speed of 3-phase induction motors by stator voltage and rotor resistance method.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE356L	Electrical & Electronic Measurement Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurements of inductance using Maxwell's L-C bridge and determination of Q factor.
3. Measurements of capacitance using De-sauty's bridge and determination of dissipation factor.
4. Adjustment and calibration of l-Φ Energy meter.
5. Measurement of power in a balanced 3-phase circuit using two wattmeter's for star and deltaconnected loads.
6. Evaluation of transfer characteristics of Resistance Temperature Detector (RTD) using RTDmodule.
7. Evaluation of transfer characteristics of Light Dependent Resistor (LDR) using LDR module.
8. Evaluation of transfer characteristics of Semiconductor Temperature Sensor using LM35sensor module/unit.
9. Evaluation of transfer characteristics of Linear Variable Differential Transformer using LVDTmodule.

Course Outcomes:

1. Student shall be able to use measuring devices and sensors.
2. Student shall be able to analyze electrical circuits from the reading and results obtained from various circuits.
3. Student shall be able to interpret the analysis results obtained and drive inference for the given circuits/systems.

Syllabus for B.E. III - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE357L	Network Analysis Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Determination of equivalent resistance in complex electric circuits with star and delta conversions
2. Determination of Average value, rms value, Form factor, Peak factor of sinusoidal wave and square wave
3. Verification of mesh analysis (With all possible combinations of Voltage and Current sources including a supermesh, AC and DC)
4. Verification of node analysis (With all possible combinations of Voltage and Current sources including a supernode, AC and DC)
5. Verification of super position theorem (AC and DC, including dependent sources)
6. Verification of reciprocity theorem (AC and DC)
7. Verification of maximum power transfer theorem with both resistive and impedance loads (AC and DC)
8. Verification of Thevenin's and Norton's theorem (AC and DC, including dependent sources)
9. Verification of Milliman's theorem (AC and DC, including dependent sources)
10. Determination of frequency response for series resonance and parallel resonance circuits
11. Determination of transient response of current in RL and RC circuits with step voltage input

Reference Books:

1. William H, Jack E Kemmerly and Steve Durbin, "Engineering Circuit Analysis", 8th Edition, Tata McGraw Higher Education, 2013.
2. M.E.VanValkenburg, "Network analysis", 3rd Edition, PHI Learning, 2014.
3. Roy Chowdhary, "Network and Systems", 2nd Edition, New age International Publications, 2010.
4. Charles K. Alexander, Matthew N. O. Sadiku "Fundamentals of Electric Circuits", 5th Edition, Tata McGraw Higher Education, 2013.

Course Outcomes:

1. Student shall be able to identify and use the voltage & current sources and other passive elements of electrical networks
2. Student shall be able to verify the electric network theorems and analyze the behavior of circuit elements
3. Student shall be able to interpret the analytical calculations with experiments results of the circuit analysis

Syllabus for

B.E. IV - Semester

for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UMA491C	Statistics and Probability Distribution	03 - Credits (3: 0: 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10 Hours)
Statistics: Curve fitting by the method of least squares: $y=a+bx$, $y=ab^x$, $y=a+bx+cx^2$ Correlation, expression for the rank correlation coefficient and regression.	
UNIT – II	**(10 Hours)**
Probability: Probability: addition rule, conditional probability, multiplication rule, Baye's rule. Discrete and continuous random variables-Probability density function, Cumulative distribution function, Problems on expectation and variance	
UNIT – III	**(10 Hours)**
Probability Distributions: Binomial distributions Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.	
UNIT – IV	**(10 Hours)**
Markov chains: Markov chains: Introduction, Probability vectors, Stochastic Matrices, Fixed Points and Regular stochastic Matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states.	

Reference Books:

1. Seymour Lipschutz, "Theory and problems of probability", Schaum Outline Series, 2020.
2. Steven Chapra, Raymond Canale, "Numerical Methods for Engineers", 6th Edition, Tata McGraw Hill Publishers, 2018.
3. Dr. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi.
4. H. K. Das, "Advanced Engineering Mathematics", S. Chand & company Ltd. Ram Nagar, New Delhi.
5. E Kreyszig, "Advanced Engineering Mathematics", Wiley & Sons, 10th Edition, 2011.

Course Outcomes:

After completion of this course, students are able

1. To apply the least square sense method to construct the specific relation for the given group of data.
2. To understand the concept of probability.
3. To apply the concept of probability to find the physical significance of various distribution phenomena.
4. To understand the concepts of probability distributions.
5. To apply the concept of Markov Chain for commercial and industry purpose.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE451C	Signals and Systems	04 - Credits (3: 2: 0)
Hours/Week : 05		CIE Marks : 50
Total Hours : 65		SEE Marks : 50

UNIT – I	
Introduction: Definitions of signals and systems, classification of signals, basic operations on signals, Elementary signals, and, properties of systems.	
UNIT – II	
Time-domain Representation for LTI Systems: Convolution, impulse response representation, properties impulse response representation, blocks diagram representations.	
UNIT – III	
Fourier Analysis of periodic and Aperiodic Signals: Introduction, Properties of continuous-time Fourier series (excluding derivation of defining equations for CTFS), Fourier representation of discrete-time periodic signals, properties of discrete-time Fourier series (DTFS).	
UNIT – IV	
Z-Transforms: Introduction, Z transform, properties of ROC, properties of the Z - transform, inversion of Z -transform, Long division method, Partial fraction expansion method, Transfer function, causality and stability.	
Reference Books: 1. Simon Haykin and BaryVam Veen, "Signals and Systems," John Wiely and Sons, 2nd Edition2014. 2. H P HSU, "Signals and Systems," Schaums Outline, TMH, 2nd Edition2011. 3. Michel J Roberts, "Signals and Systems-Analysis of signals through linear systems" TMH, 2003. 4. Alan V Oppenheim, Alan S.Will sky and S.hamid Nawab, "Signals and Systems," Pearson Education, Indian Reprint, 2nd Edition2013.	
Course Outcomes: After completion of the course, 1. Students shall be able to classify different types of signals and systems. 2. Students shall be able to list and define different types of elementary signals and systems. 3. Students shall be able to derive the properties of signals and systems, convolution, Fourier series, Fourier transform and Z-transform. 4. Students shall be able to solve convolution sum and integral, CTFS and DTFS. 5. Students shall be able to decide the stability of system in the Z domain for different types of systems. 6. Students shall be able to construct the continuous time and discrete time system using direct form-I and canonical form.	

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE452C	Power Electronics	04 - Credits (4 : 0 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(13 Hours)

Introduction:
Introduction to power electronics, block diagram of power electronic converter system, applications of power electronics. Types of power electronic circuits and their peripheral effects.

Power Transistors: Introduction to Power BJT's, MOSFETs and IGBT's –static characteristics, switching characteristics, switching limits, di/dt and dv/dt protection, cooling, heat sinks and snubber circuits.

Thyristors: Introduction, static characteristics, two transistor model. Switching characteristics, di/dt and dv/dt protection.

UNIT – II	(13 Hours)

Controlled Rectifiers: Introduction, Classification of rectifiers, principle of phase-controlled converter operation. Single- phase half wave, semi-converters and full converters and problems. Three-phase half wave, semi converters and full converters with R, R-L and RLE load. Performance evaluation of Rectifier.

UNIT – III	(13 Hours)

Commutation Techniques: Introduction. Natural commutation, forced commutation: self-commutation, impulse commutation, resonant pulse commutation and complementary commutation.

DC –DC Converter: Introduction. Principle Operation of dc-dc converter, Control Strategies: constant frequency, Variable Frequency, Four quadrant operation of dc-dc converter. Detailed analysis of Class-A chopper with numericals, principle operations of Class-B, Class-C, Class-D and Class-E chopper

UNIT – IV	(13 Hours)

Inverters: Introduction. Types of inverters, performance parameters, principle of operation of half bridge and full bridge inverters with R and R-L load. Three phase inverter configurations to operate with 120- and 180-degree modes. Voltage control of single-phase inverters – single pulse width modulation, multiple pulse width modulation and sinusoidal pulse width modulation.

AC Voltage Controllers: Introduction. Principle of ON-OFF control and phase control. Single-phase half wave and fullwave AC voltage controllers with resistive and inductive loads.

Reference Books:

1. M.H.Rashid "Power Electronics", 3rd - Edition, P.H.I./Pearson, New Delhi, 2002.
2. Mohan, Undeland, Robbins" Power Electronics" Wiley Edition 2003
3. P.S.Bimbra, "Power Electronics"**,** IV- edition, Khanna Publishers, 2009.
4. G.K. Dubey, S.R. Dorodla, A. Joshi and R.M.K. Sinha, "Thyristorised Power Controllers", NewAge International Publishers, 2005.
5. M.D. Singh and Khanchandani K.B., "Power Electronics**",** 2nd - Edition Khanna Publisher, 2007.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

Course Outcomes:

After completion of the course,

1. Students will able to recall and understand the principle operation of various power converters such AC-DC, DC-DC, DC-AC and AC-AC.
2. Students will able to classify types of power electronics circuits that effect power quality.
3. Students will be able to analyze the controlled rectifier, DC-DC converter, PWM inverters and AC controllers for R and RL loads.
4. Students able to design the circuit elements of chopper employed for the controlling of DC motor and circuit elements of commutation circuits
5. Students will be to illustrate and analyze the various control strategies in controlling of chopper and voltage source inverter.
6. Students will be able to design the heats sinks, circuit elements of snubber/protection circuits.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE453C	Operational Amplifiers and Linear IC's	04 - Credits (4 : 0 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(13 Hours)

Op-Amps:

Block diagram and characteristics of 741 Op-amp, Op-amp as an inverting and non-inverting amplifier, voltage follower, adder, subtractor, integrator and differentiator.

Op-Amps as AC Amplifier:

Capacitor coupled voltage follower, high Z_{in} capacitor coupled voltage follower, capacitor coupled non- inverting amplifier, high Zin capacitor coupled non - inverting amplifier, capacitor coupled inverting amplifier, setting the upper cut - off frequency, capacitor coupled difference amplifier and use of single polarity supply.

UNIT – II	(13 Hours)

Op-Amps Frequency Response and Compensation:

Op-amp circuit stability, frequency and phase response, frequency compensating methods, manufacture's recommended compensation, op-amp circuit band width, slew rate effects, stray capacitance effects, load capacitance effects, Z_{in} mod compensation and circuit stability precautions.

Signal Processing circuits:

Precision half wave & full wave rectifiers, limiting circuits, clamping circuits, peak detectors, sample and hold circuits.

UNIT – III	(13 Hours)

Op-amp Nonlinear circuits:

Op-amps in switching circuits, zero crossing detectors, inverting Schmitt trigger circuit, non-inverting Schmitt circuit. Astable multivibrator and mono-stable multivibrator using 555 timer.

Signal Generator:

Triangular/Rectangular wave generator, waveform generator design, phase shift oscillator, oscillator amplitude stabilization, Wein bridge oscillator, signal generators output controls.

UNIT – IV	(13 Hours)

Active Filters:

First and second order high pass and low pass filters, band stop and band pass filters.

D.C Voltage Regulators:

Voltage regulators basics, voltage follower regulator, adjustable output regulator, LM217 and LM237 integrated circuit voltage regulators.

Reference Books:

1. David A. Bell, "Operational Amplifier and Linear ICS", 3rd edition, Oxford, 2012.
2. Ramakanth A. Gayakwad, "Operational Amplifier and Linear ICS", 4th edition, PHI, 2016.
3. R.F. Coughlin & F.F. Driscoll, "Operational Amplifier and Linear ICS", 6th edition, PHI, 2015.
4. Bruce Carter and Ron Mancini, "OP AMPS for everyone", 4th edition, Elsevier, 2013

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

Course Outcomes:

After completion of the course,

1. Student should be able to explain the characteristics of Op-Amp.
2. Student should be distinguishing the operational function of the amplifier.
3. Student should be able to explain about the AC amplifier.
4. Student should be able to define the frequency response of op-amps.
5. Student should be able to design the application of op-amp.
6. Student should be able to evaluate the various types of the filters.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE454C	DC Machines and Synchronous Machines	04 - Credits (4 : 0 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(13 Hours)

Single Phase Transformer:
Constructional details and EMF equation, Phasor diagrams, Calculation of equivalent circuit parameters by OC and SC tests, Transformer ratings and per unit (p.u.) scaling, Losses & efficiency, all day efficiency, voltage regulation, polarity test and Sumpner's test.
Auto Transformer: Construction, working principle, saving of copper, equivalent circuit and applications.

UNIT – II	(13 Hours)

DC Generator:
Construction of DC machines, types of windings, emf equation, types of excitations, no load and load characteristics, armature reaction, calculation of demagnetizing and cross magnetizing AT/pole, concept of compensating winding, commutation, inter poles, application of DC generators.
DC Motors:
Principle of Operation & concept of back EMF, torque equation, characteristics and application of D.C. motors.

UNIT – III	(13 Hours)

Three Phase Induction Machines:
Construction & types of motors, Principle of operation, production of rotating magnetic field, slip, rotor induced emf and it's frequency, power losses in an induction motor, equivalent circuit, torque equation, torque-slip characteristics-motoring generating and braking modes, starting torque, maximum torque, effect of rotor resistances on torque slip - characteristics, power output, no load and blocked rotor test- evaluation of equivalent circuit parameters, circle diagram and obtain it's performance, double cage and deep bar motors, Cogging and crawling.

UNIT – IV	(13 Hours)

Synchronous Machines:
Construction and types of synchronous Machines, types of field excitation, double layer distributed chorded winding example, emf equation for generator, effect of distribution and chorded coils, effects of harmonics on emf generated, phasor diagram of a Synchronous generator with cylindrical rotor, calculation of voltage regulation by EMF, MMF, and ZPF methods.
Salient pole synchronous machines: Phasor diagram and power developed.

Reference Books:

1. I J Nagarath and DP Kothari, “Electrical machines”, 4th - Edition, TMH, New Delhi
2. B . L .Theraja “Electrical technology” vol –II, S. Chand publications, New Delhi, 2018
3. Ashfaq Hussain, “Electrical Machines”, Dhanpat Rai & Co. Publications, 3rd Edition, 2017
4. P.S. Bhimra, “Electrical machinery”, Khanna publishers. 7th Edition 2018

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

Course Outcomes:

After completion of the course, the students will be able to:

1. Explain the principle operation construction and classification of both AC and DC machines.
2. Explain the performance operation of both AC and DC machines.
3. Identify the machines for different operations/applications by using operating characteristics of machines.
4. Calculate different parameters like losses and efficiency by conducting different tests on different machines and gives the conclusion.
5. Solve the numerical and compare the results.
6. Select the machines for different field applications and identify the significance of parallel operation.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE456L	Power Electronics Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Static characteristic of SCR.
2. Static and Switching characteristic of IGBT and MOSFET.
3. Static characteristic of TRIAC.
4. Study of SCR firing circuit (R, RC, UJT, Digital).
5. Single Phase half wave-controlled rectifier with R and RL load.
6. Single phase half-controlled bridge rectifier with R and RL load.
7. Single phase fully controlled bridge rectifier with R and RL load.
8. Speed control of a separately excited D.C. motor using an IGBT an MOSFET chopper.
9. Study of SCR commutation circuit.
10. Half wave and Full wave bridge Inverter for R and RL load.

Course Outcomes:

1. Students shall be able to explain the basic operation of various power semiconductor devices and passive components.
2. Students shall be able to apply power electronic circuits for different loads.
3. Students shall be able to demonstrate the ability to apply what they have learned theoretically in the field of Power electronics.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE457L	DC Machines and Synchronous Machines Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments
1. OCC characteristics of D.C. Shunt generator. 2. Load characteristics of a D.C. generator. 3. Load test on a DC motor- determination of speed-torque and BHP-efficiency characteristics 4. Speed control of DC motor by armature voltage control and flux control. 5. Swinburne's test. 6. Ward Leonard method of speed control of D.C. motor. 7. Hopkinson's Test. 8. Fields test on series motors. 9. Voltage regulation of alternator by EMF, MMF, method. 10. Voltage regulation of alternator by ZPF method. 11. Synchronization of Alternator with infinite bus. 12. V and Inverted V curves of a synchronous motor.
Course Outcomes: 1. Students shall be able to design Op-Amp circuits and analyze simple applications of abovecircuits. 2. Students shall be able to design Filter circuits and understand the principles of timers andoscillators. 3. Students shall be able to design and analyze rectifier circuits.

Syllabus for B.E. IV - Semester for academic year 2021 – 2022

(For students admitted to I year in 2020-21)

UEE458L	Linear IC's Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Study of Op-Amp as
   a. Inverting and non-inverting amplifier
   b. Integrator and differentiator.
2. Study of Op-Amp as
   c. Voltage follower
   d. Adder and substractor
3. Study of Op-Amp as zero crossing detector
4. Study of Op-Amp as Schmitt trigger
5. Study of Op-Amp as triangular and rectangular wave generator.
6. Design and testing of Op-Amp based RC phase shift oscillator.
7. Design and testing of Op-Amp based RC Wein bridge oscillator.
8. Study of rectifiers using Op-Amp.
9. Design and testing of filters of the first and second order using Op-Amp.
10. Study of Astable multivibrator using Op-Amp.
11. Study of Astable multivibrator using 555 timer.

Course Outcomes:

1. Students shall be able to design Op-Amp circuits and analyze simple applications of above circuits.
2. Students shall be able to design Filter circuits and understand the principles of timers and oscillators.
3. Students shall be able to design and analyze rectifier circuits.

Syllabus for

B.E. V - Semester

for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE551C	Field Theory	03 - Credits (2 : 2 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(7L-6THours)

Review of Vector Analysis:
Introduction to Scalars and vectors

Coulomb's Law and Electric Field Intensity:
Experimental law of Coulomb, electric field intensity, field due to continuous volume charge distribution, field of a line charge, field of a sheet charge.

Electric Flux Density, Gauss' Law and Divergence:
Electric Flux Density, Gauss' Law, Divergence. Maxwell's first equation (Electrostatics), vector operator V and the divergence theorem.

UNIT – II	(6L-7THours)

Energy and Potential: Energy expended in moving a point charge in an electric filed, the line integral, definition of potential difference and potential. The potential field of a point charge and system of charges, potential gradient, the dipole.

Conductors, Dielectrics and Capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and Boundary conditions, capacitance.

UNIT – III	(7L-6THours)

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

Magnetic Forces:
Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

UNIT – IV	(6L-7THours)

Materials and Inductance:
The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials.

Time Varying Fields and Maxwell's Equations:
Faraday's law, displacement current, Maxwell's equation in point and Integral form.

Reference Books:

1. William H.Hayt Jr. and John A Buck, "Engineering Electromagnetics**",** 17th edition, Tata McGraw Hill, 2012.
2. John Karuss and Daniel A Fleisch, "Electromagnetics with Applications" V-edition McGraw-Hill, 1999.
3. Edward C. Jordan and Keith G Balmain, **"**Electromagnetic Waves and Radiating Systems**,"** II- edition, Prentice Hall of India / Pearson Education, 1968. Reprint 2002.
4. Dr. D. Ganesh Rao, "Field Theory" Sanguine Technical Publishers, 1st Edition, 2014.

Course Outcomes:
After completion of the course the students will be able to,

1. Identify differential coordinate elements for the various electric and magnetic field applications

2. Estimate the flux density, field intensity of electric and magnetic fields for various charges
3. Analyze the time varying and static electric and magnetic fields for various charges
4. Select the suitable time varying Maxwell's equation for real-time application of electromagnetism.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE551C.1	3	1	1	1	3	1		1		1		1	1	3	2
2	UEE551C.2	3	2	1	1				1		1		1	1	1	2
3	UEE551C.3	3	2	2	2	1		1	1		1		1	2	3	1
4	UEE551C.4	3	3	3	2	1			1	1	1	1	2	2	1	1

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE552C	Digital Signal Processing	03 - Credits (2 : 2 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(7L-6THours)

Discrete Fourier Transform:

Introduction, Definition, and derivation of DFT and IDFT, Properties-linearity, shift, Symmetry etc., circular convolution, periodic convolution, use of tabular arrays, circular arrays, Stock Ham's methods, Linear convolution-two finite duration sequences, One finite and one infinite duration –overlap add method-Problems

UNIT – II	(7L-6THours)

Fast Fourier Transform Algorithms:

Introduction, decimation in time algorithm (DIT-FFT, DIT-IFFT), First decomposition, Continuation of decomposition, number of computations, number of multiplications, Computational efficiency-Problems

Design of FIR Digital filters:

Introduction, Windowing, rectangular, Hamming window-Problems

UNIT – III	(7L-6THours)

Design of IIR Digital filters:

Introduction, all pole analog filters- Butterworth and Chebyshev, Design of analog filters, Bilinear Transformation, Design of digital Butterworth and Chebyshev filters, Frequency transformations-Problems

UNIT – IV	(7L-6THours)

Realization of Digital Systems:

Introduction, block diagrams and SFG's, Realization of IIR systems- direct form, cascade form, Parallel form, Realization of FIR systems- direct form, cascade form, Linear phase realizations-Problems

DSP Processors TMS320:

Architecture and electrical applications (block diagram approach)

Reference Books:

1. Digital Signal Processing Principle, algorithms and applications 4th edition by Proakis, Pearson Education 2012
2. Digital Signal Processing by Sanjith K. Mithra Edition, 2013
3. Digital Signal Processing by Oppenheim, Pearson Education / PHI, 2015
4. Digital Signal Processing by Salivatanam, A Vallavaraj, Gnanapriya , TMH 2011
5. Digital Signal Processing by Ifeachor Emmauel, Pearson Education, 2nd edition 2010

Course Outcomes:

After completion of the course the students will be able to,

1. Recall DFT, IDFT, and basic properties of DSP
2. Derive DFT properties, FFT algorithms, filter equations, and convolution output and classify filters
3. Assess the output of system by linear & circular convolution, Stockhams method, and FFT algorithms
4. Implement/realize the discrete LTI system in direct form I & II, cascade and parallel forms and Design a filter for the given specifications

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE552C.1	3	1	1		3	1		1		1		2	1	3	1
2	UEE552C.2	3	2	1					1		1		2	1	3	1
3	UEE552C.3	2	2		2	1		1	1		1		1	1	3	1
4	UEE552C.4	2	3	3	2	1			1	1	1	1	2	1	3	1

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE553C	Control Systems	03 - Credits (2 : 2 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(7L-8T Hours)
Introduction and Transfer Function of Systems: Classification of control systems, open loop and closed loop systems, effects of feedback, mathematical models of physical systems; definition of transfer function, mechanical systems, rotational systems, electrical systems, analogous systems.	
UNIT – II	**(6L-6T Hours)**
Block Diagrams and Signal Flow Graphs: Block diagrams (BD), reduction of BD, signal flow graphs (SFG), drawing block diagram and SFG of simple networks, Mason's gain formula, converting BD into SFG.	
UNIT – III	**(7L-6T Hours)**
Time Response of Feed Back Control Systems: Standard test signals, unit step response of first and second order systems, time response specifications, and Time response specifications of second order systems, steady state errors and error constants. **Stability Analysis:** Concepts of stability, necessary conditions for stability, Routh's stability criterion. **Root–Locus Analysis:** Root locus concepts, construction of root loci. **Introduction to State Variable Analysis**: Concepts of state, state variables and state model, state models for linear continuous time systems, conversion of state model to transfer function and transfer function to state model.	
UNIT – IV	**(6L-6T Hours)**
Frequency Domain Analysis: Introduction, frequency domain specifications, correlation between time and frequency response, method to draw bode plot, phase margin, gain margin. **Nyquist stability criterion**.	

Reference Books:

1. Norman S. Nise "Control System Engineering", McGraw Hill, 2010.
2. Benjamin C. Kuo, "Automatic Control System", 7th Edition, PHI, 2010.
3. Richard C. Dorf Robert H. Bishop "Modern Control Systems", 8th Edition, Addison-Wesley,1999
4. Katsuhiko Ogata, Modern Control Engineering, Prentice–Hall of India Private Limited, 2001

Course Outcomes:

After completion of the course the students will be able to:

1. Classify control systems based on a number of ways and select them for particular applications.
2. Develop mathematical modeling of LTI control systems via differential equation formation, transfer function, and state space analysis.
3. Employ time domain analysis to predict and diagnose transient performance parameters of LTI control systems for standard input functions.
4. Formulate different types of analysis in frequency domain to obtain the stability of the LTI control systems.

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE553C.1	3	3	2	2								1		2	
2	UEE553C.2	3	3	3	2								1		3	
3	UEE553C.3	3	3	2	2						1		1		3	
4	UEE553C.4	3	3	2	2						1		1		3	

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE554C	Generation Transmission and Distribution	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10 Hours)

Electrical Power Generation:

Hydro Power Generation: Site selection, Line diagram representation, Classification, Merits and Demerits. Thermal Power Generation: Site selection, Line diagram representation, Classification, Merits and Demerits. Nuclear Power Generation: Site selection, Line diagram representation, Classification, Merits and Demerits.

Basic Aspects of Power Generation:

Introduction, Load curve and load duration curve. Terms commonly used in system operation: Load factor, Diversity factor, Demand factor, plant capacity factor, plant utilization factor, Installed capacity, reserve capacity, Cold reserve, hot reserve, Spinning reserve, firm power. Effect of diversity factor on cost of generation. Interconnection of power stations, transfer of power. Economic Loading of interconnected stations.

UNIT – II	(10 Hours)

AC Transmission Systems:

Typical AC transmission system, Advantages of high voltage transmission. Comparison of conductor material in overhead lines: 3 phase 3 wire systems, 3 phase 4 wire system. Components of overhead transmission line: Conductors, Line supports, Insulators – Types, Potential distribution over suspension insulator string, String efficiency, Methods of improving string efficiency. Corona – Factors affecting corona, Imp terms, Methods of reducing corona. Sag in overhead lines- Calculation of sag for equal and unequal supports, Effect of wind and ice loading on sag.

Electrical Parameters of Overhead Transmission Lines:

Constants of Transmission line. Inductance of single phase two wire line, Capacitance of single phase two wire line.

UNIT – III	(10 Hours)

Performance of Transmission Lines:

Classification of overhead Transmission line. Short Transmission line, Medium Transmission line – End condenser method, Nominal T method, Nominal π method, Long Transmission line. Generalized circuit constants (ABCD) of a transmission line.

Underground Cables:

Construction of underground cables, Insulating materials for underground cables, Laying of underground cables. Insulation resistance of single core cable, Capacitance of single core cable, Dielectric stress in a single core cable.

UNIT – IV	(10 Hours)

Distribution Systems:

Classification of distribution systems. Overhead Vs Underground distribution system. Connection schemes of distribution system. Requirements of a distribution system.

DC Distribution:

Types of DC distributors, DC distributor fed at one end- Concentrated loading, Uniform loading. DC distributor fed at both ends - Concentrated loading.

AC Distribution:

AC distribution calculation, Methods of solving AC distribution issues.

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Reference Books:

1. Soni, Gupta and Bhatnagar, "Power System Engineering", 5th edition, Dhanapat Rai and Co.(P) Ltd. Publishers, New Delhi, 2016.
2. Mehta V K and Rohit Mehta, " Principals of Power Systems", 4th edition, S Chand and Company Ltd, Publishers, New Delhi, 2015.
3. Gupta J B, "Transmission and Distribution of Electrical power", 9th edition, Sanjeev jumar Kataria Publishers, New Delhi, 2012.
4. Wadhwa C L, "Generation, Distribution and Utilization of Electrical Power", 3rd edition, New age International (p) Ltd., New Delhi, 2012.

Course Outcomes:

After completion of the course the students will be able to,

1. **List and define** various parameters and features of Electrical power generation, transmission and distribution.
2. **Explain** different mechanical and electrical parameters related to Electrical power generation, transmission and distribution.
3. **Compare and contrast** the features of Electrical power generation, transmission and distribution.
4. **Evaluate/calculate** various parameters related to Electrical power generation, transmission and distribution.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE554C.1	3							1		1		1	2	1	2
2	UEE554C.2	3	1						1		1		1		2	
3	UEE554C.3	3	3	2	2	1			1		1		1		3	
4	UEE554C.4	3	3	3	3	1			1	1	1		2	3	3	3

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE557E	Electrical Machine Design	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10 Hours)
Principles of Electrical Machine Design: Introduction to design of electrical machines, limitations. Different types of materials and insulators used in electrical machines. **Design of DC Machines:** Output equation, choice of specific loadings and number of poles, design of main dimensions, armature slot dimensions and estimation of ampere turns.	
UNIT – II	**(10 Hours)**
Design of Transformers (Single phase and three phase): Output equation for single phase and three phase transformer, choice of specific loadings, expression tor volts/turn, determination of main dimensions of the core, types of windings and estimation of number of turns and cross sectional area of Primary and secondary coils and Design of tank and cooling tubes.	
UNIT – III	**(10 Hours)**
Design of Induction Motors: Output equation, choice of specific loadings, main dimensions of three phase induction motor, stator winding design, choice of length of the air gap, estimation of number of slots for the squirrel cage rotor, end ring current.	
UNIT – IV	**(10 Hours)**
Design of Synchronous Machines: Output equation, choice of specific loadings, short circuit ratio, design of main dimensions, armature slots and windings, slot details for the stator of salient and non salient pole synchronous machine. Design of rotor of salient pole synchronous machines, magnetic circuits and rotor of non salient pole machine.	

Reference Books:

1. A.K. Sawhney, A Course in Electrical Machine Design, Dhanpat Rai & Co. (P) Limited (2017), ISBN-10: 8177001019, ISBN-13: 978-8177001013.
2. Mittle V.N., Arvind Mittal, Design of Electrical Machines, Standard Publishers Distributors (2009), ISBN-13: 978-81-8014-126-3, ISBN: 81-8014-126-8.
3. V. Rajini, V. S. Nagarajan Electrical Machine Design Pearson Education (May 2018) ISBN-10: 9332585571, ISBN-13: 978-9332585577
4. K. G. Upadhyay Design of Electrical Machines (2010) Publisher: New Age International ISBN: 9788122422825, 8122422829.

Course Outcomes

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

1. Identify, list and define different types of materials, parts, insulators, and the terms associated to electrical machines and its design terms.
2. Explain the specific loadings, design factors for electrical machines.
3. Calculate the design parameters of an electrical machine for a given set of specifications and necessary assumptions as per the Indian standards.
4. Derive the equations with respect to specific loadings, dimensions and other design aspects for electrical machines.

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE557E.1	3	2	2					1		1		1	1	2	1
2	UEE557E.2	3	2	2					1		1		1	2	1	1
3	UEE557E.3	3	3	3	3				1	2	1		1	1	2	1
4	UEE557E.4	3	3	3	2				1		1		2	1	2	1

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE555N	Renewable Energy Sources	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10L-0T Hours)
Introduction to Energy Sources: Classification of Energy Resources; Conventional Energy Resources – Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources. **Solar Energy Basics:** Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (only theory); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer. **Solar Thermal Systems:** Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, Concentrating dish type; Solar driers, Solar Still.	
UNIT – II	**(10L-0T Hours)**
Solar Electric Systems: Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, module, panel and array. Solar PV Systems – Street lighting, Domestic lighting and Solar Water pumping systems. **Wind Energy:** Wind and its Properties, History of Wind Energy. Basic principles of Wind Energy Conversion Systems (WECS), Classification of WECS, Parts of a WECS, Derivation for Power in the wind, Advantages and Disadvantages of WECS	
UNIT – III	**(10L-0T Hours)**
Biomass Energy: Introduction, Photosynthesis process, Biomass conversion technologies; Biomass Gasification – Principle and Working of Gasifiers, Biogas - production of biogas, factors affecting biogas generation, types of biogas plants–KVIC and Janata model. **Geothermal Energy:** Introduction, Geothermal resources (brief description); Advantages and disadvantages; Applications of Geothermal Energy.	
UNIT – IV	**(10L-0T Hours)**
Energy from Ocean: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitation of TPP. **Ocean Thermal Energy Conversion (OTEC):** Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Advantages and Limitation of OTEC. **Emerging Technologies:** Fuel Cell, Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations).	
Reference Books: 1. A Khan, B. H., Non-Conventional Energy Resources, TMH, New Delhi, 2006. 2. Rai, G. D., Non-Conventional Sources of Energy, IV- Edition, Khanna Publishers, New Delhi, 2007 3. Mukherjee, D., and Chakrabarti, S., Fundamentals of Renewable Energy Systems, New Age International Publishers, 2005. 4. Tiwari,G.N., and Ghosal,M.K., Renewable Energy Sources: Basic Principles and Applications, Alpha Science International, Ltd., New Delhi, 2006.	

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes

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

1. List and define various parameters and features of solar, wind, biomass, geothermal and ocean energy conversion systems.
2. Explain various concepts and theory related to solar, wind, biomass, geothermal and ocean energy conversion systems.
3. Evaluate/calculate various parameters related to solar and wind energy conversion systems.
4. Relate/articulate the concepts and theories related to solar, wind, biomass, geothermal and ocean energy conversion systems.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE555N.1	3	1	1				1	1		1		1	2	2	2
2	UEE555N.2	3	1	1				2	1		1		1		3	
3	UEE555N.3	3	2	1				2	1	1	1		1	1	1	2
4	UEE555N.4	3	3	3				2	1		1		2	2	1	3

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE561L	Digital Signal Processing Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Generation of Unit step, ramp, exponential and sinusoidal signals
2. Convolution of two signals
3. To determine power and energy of the signals
4. To determine impulse response given y(n) and x(n)
5. To determine DTFT of given sequence
6. Circular convolution of two given sequences
7. Computation of N – point DFT of a given sequence and to plot magnitude and phase
8. Linear convolution of two sequence using DFT and IDFT
9. Circular convolution of two sequences using DFT and IDFT
10. Design and implementation of FIR and IIR fitter to meet given specifications.
11. Study of DSP starter kits (DSK)
12. Linear convolution Using DSK
13. Circular Convolution using DSK
14. Computation of N point DFT using DSK

Reference Books:

1. Digital Signal Processing Principle, algorithms and applications, 4th edition by Proakis, Pearson Education 2012
2. Digital Signal Processing by Sanjith K. Mithra Edition, 2013
3. Digital Signal Processing by Oppenheim, Pearson Education / PHI, 2015
4. Digital Signal Processing by Salivatanam, A Vallavaraj, Gnanapriya , TMH 2011

Course Outcomes:

After completion of the course the students will be able to:

1. Develop programs for generating basic signals
2. Analyze and execute programs for convolution, DFT, FFT, Impulse Response
3. Design and analyze the filters and draw inference with reference to theoretical values

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE661L.1	3	1	1		1	1					1	1		2	1
2	UEE561L.2	3	1	1	1	2						1	1		2	3
3	UEE561L.3	3	1	1	1	2						1	1		3	1

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE562L	Control System Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Determine time domain response of second order systems for step input and obtain performance parameters.
2. a) Experiment to draw the speed – torque characteristic of a A.C. servomotor.
   b) Experiment to draw the speed torque characteristic of a D.C. servomotor.
3. Design a passive RC lead compensating network for the given specifications, viz., the maximum phase lead and the frequency at which it occurs and to obtain its frequency response.
4. Study the synchro-transmitter and receiver and obtain output vs input characteristics.
5. Determine experimentally the frequency response of a second -order system and evaluation of frequency domain specifications.
6. Design RC lag compensating network for the given specifications. viz., the maximum phase lag and the frequency at which it occurs, and obtains its frequency response.
7. Experiment to draw the frequency response characteristic of a given lag- lead compensating network.
8. Design a PID controller and study its effect on steady state error.
9. Plot the root locus diagram of an open loop transfer function and determine range of gain 'k' for stability. Using MATLAB software
10. Plot a Bode diagram of an open loop transfer function. Using MATLAB software
11. Draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system. Using MATLAB software.

Reference Books:

1. Norman S. Nise "Control System Engineering", McGraw Hill, 2010.
2. Benjamin C. Kuo, "Automatic Control System", 7th Edition, PHI, 2010.
3. Richard C. Dorf Robert H. Bishop "Modern Control Systems", 8th Edition, Addison-Wesley,1999
4. Katsuhiko Ogata, Modern Control Engineering, Prentice–Hall of India Private Limited, 2001

Course Outcomes:

After completion of the course the students will be able to:

1. Analyze and verify experimental results of a toque- speed characteristic of DC and AC servomotor with the frequency response and time response analysis of a second order control system through conduction.
2. Analyze stability of the system through Root Locus, Bode plot and Nyquist plot. Using MATLAB
3. Analyze Lag, Lead, Lead-Lag compensators network and the effect of P, PI, PD and PID controllers on a control system verify experimental results through conduction.

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE662L.1	3	1	1		1	1					1	1	1	2	2
2	UEE562L.2	3	2	2	1	2						1	2	1	3	3
3	UEE562L.3	3	2	2	1	2	2					1	2		3	3

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE563L	Analog and Digital Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Design and testing of diode clipping and clamping circuits.
2. Design of fixed bias and voltage divider bias circuits for BJT.
3. Design of RC coupled single stage BJT amplifier and determination of the gain, frequency response, input and output impedances.
4. Calculation of hybrid parameters of a CE transistor amplifier
5. Simplification, realization of Boolean expressions using logic gates /Universal gates. (i) Realization of Full adders and Full Subtractors using logic gates (ii) Realization of parallel adder/subtractors using 7483 chip
6. Realization of Binary to Gray Code conversion and vice versa.
7. MUX / DEMUX-use of 74153, 74139 for arithmetic circuits and code converters
8. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
9. Truth table verification of Flip- Flops (i) JK Master slave (ii) T type and (iii) D type
10. Realization of 3 bit counters and MOD- N counter design (7490, 74193).
11. Shift left; Shift Right; SIPO, SISO, PIPO, PISO, operations using 74S95.
12. Ring counter and Johnson counter.

Reference Books:

1. Jacob Milliman, Christos C. Halkias, Chetan D. Parikh, Integrated Electronics-Analog and Digital Circuits and Systems, 2ndedition, Tata McGraw Hill Education Private Limited, New Delhi, 2015.
2. G. K. Mithall, Electronic Devices and Circuits, Khanna Publishers, New Delhi, 1998.
3. David A. Bell, "Operational Amplifier and Linear ICS", 3rdedition, Oxford, 2012.
4. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuits Theory, 9th edition, Pearson/Prentice Hall, India, 2006.

Course Outcomes:

After completion of the course the students will be able to:

1. Student should be able to select appropriate components and write the requirement table based on experiment
2. Student should be able to write the procedure, simplify the expressions using K-map and realize the circuit
3. Student should be able to rig-up the circuit and verify output

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UEE663L.1	3				1	1					1	1	1	2	1
2	UEE563L.2	3	1		1	2						1	2	1	1	1
3	UEE563L.3	3	2	2	1	2	2					1	2	2	2	2

Syllabus for B.E. V - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UHS002N	Advanced Quantitative Aptitude and Soft Skills	01 - Credits (1 : 0 : 0)
Hours/Week : 01		CIE Marks : 50
Total Hours : 15		SEE Marks : 50

UNIT – I	(06 Hours)
Quantitative and Reasoning Aptitude skills Training :- Speed Maths **,** Areas and Volumes, Concept Review, Number Series and Letter Series, Coding and Decoding, Concept Review	
UNIT – II	**(03 Hours)**
Verbal Aptitude Skills Training:- Reading Comprehension, Listening Comprehension, Concept Review	
UNIT – III	**(03 Hours)**
Career Skills:- Orientation to competitive exams, such as GATE, GRE, GMAT, CAT, UPSC, SSC, and Bank PO. Group Discussion – Simulation, Orientation to career paths, such as core engineering, IT engineering, public sector, banking, sales and marketing, and entrepreneurship	
UNIT – IV	**(03 Hours)**
Soft Skills:- Dressing and Grooming, Professional Etiquette, E-mail Writing	
Reference Books:- 1. Objective English - Arihant Publications 2. Data Interpretation - R.S Agarwal 3. Objective English Grammar - Kiran Publications	
Course Outcomes:- After completion of the course the students will be able to, 1. Improve verbal ability skills 2. Communicate effectively & appropriately in real life situation. 3. Enhance student's problem solving skill. 4. Prepare for various public and private sector exams & placement drives.	

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
1	UHS002N.1	3	2	1					2		2	1	2			
2	UHS002N.2	3	2	1					2		2	1	2			
3	UHS002N.3	3	2	1					2		2	1	2			
4	UHS002N.4	3	2	1					2		2	1	2			

Syllabus for

B.E. VI - Semester

for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE651C	Power System Analysis and Stability	03 - Credits (2 : 2 : 0)
Hours/Week : 04		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(8L-8THours)

Power System Representation: (4L-4T Hours)

Standard symbols of power system components, Single line diagram, Per unit system, Per unit impedance of 3 phase components, Change of base, Per unit impedance diagram, Advantages of per unit system calculations, Formation of Y- bus by inspection method-Numerical Problems

Symmetrical Three Phase Faults: (4L-4T Hours)

3 - phase short circuit at the terminals of unloaded generator, Sub transient, Transient and Steady state reactance, Transients on a transmission line, Short circuit currents and Reactance of synchronous machines on load and no load, Short circuit MVA-Numerical Problems

UNIT – II	(6L-6THours)

Symmetrical Components: (3L-3T Hours)

Definition of sequence components for 3-Phase unbalanced power systems, Operator "a" and its properties, Expressions for sequence components, Phase shift of symmetrical components in star delta transformer bank-Numerical Problems

Sequence Networks:(3L-3T Hours)

3- Ph power in terms of sequence components, voltage drop due to sequence currents, sequence impedance and sequence networks of power system elements (Alternator, Transformer and Transmission line), positive, negative and zero sequence networks of power system elements-Numerical Problems

UNIT – III	(6L-6THours)

Unsymmetrical Fault at the Terminals Unloaded Generator:(3L-3T Hours)

L-G, L-L, L-L-G fault with and without fault impedance at the terminals of unloaded generator- derivation for connection of sequence network and fault currents-Numerical Problems

Unsymmetrical Faults on Power Systems:(3L-3T Hours)

L-G, L-L, L-L-G faults on unloaded power systems, Open conductor faults in power system-Numerical Problems

UNIT – IV	(6L-6THours)

Stability Analysis: (3L-3T Hours)

Classification of Power System Stability, Steady Rotor dynamics, Swing equation, Power angle equation for salient and non salient pole synchronous machines-Numerical Problems

Equal Area Criterion:(3L-3T Hours)

Equal area criterion – Stability analysis for sudden change in mechanical input power, 3- ph fault on Generator terminals and on transmission line, Expression for critical clearing angle, Methods to improve stability of power system-Numerical Problems

Reference Books:

1. K. Uma Rao, "Computer Techniques and Models in Power Systems", 1st Edition, I. K. International publishing house, 2014.
2. Nagarath and Kothari, "Modern Power System Analysis", 3rd Edition, TMH, 2009.

3. W.D. Stevenson, “Elements of Power Systems Analysis”, 4th Edition, Mc.Graw Hill Publishers, 2013.
4. Hadi Saadat, “Power System Analysis”, TMH, Publishers, 4th Edition 2015.
5. V Neelakantan, "Power System Analysis & Stability”, Shiva Publishers, 2017

Course Outcomes:

After completion of the course the students will be able to,

1. Recall the procedure for drawing the reactance diagrams of power system network and advantages of per unit system representation
2. Illustrate the significance of fault analysis, sequence components and power system stability studies
3. Derive mathematical expressions for fault currents and rotor angle under different disturbance conditions and stability conditions
4. Make use of per unit system and sequence components to carry out symmetrical and unsymmetrical fault analysis

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE651C.1	3	1	1	1		1				1		1	2		1
2	UEE651C.2	3	2	1	1						1		1	2	1	2
3	UEE651C.3	3	2	2	2	1		1	1		1		1	2	1	2
4	UEE651C.4	3	3	3	2	1			1	1	1	1	2	1	1	2

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE652C	Microcontrollers	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10 Hours)

Microprocessors and Microcontrollers (4h):

Basics, Hexadecimal numbers, Hexadecimal addition, Block diagram of Computer, bus and Types of buses, memory address, Introduction of Microprocessors and Microcontrollers 8051, Features, Block diagram, pin diagram, program model, Architecture, PSW, PC, SP, Memory Organization

8051 Assembly Language Programming (2h):

Introduction to assembly language programming, assembling and running a program, The program counter and ROM space, data types and directives.

Addressing Modes (4h):

Introduction, Addressing modes, External Data Moves, Code Memory Read Only Data Moves, Indexed Addressing Mode, Programs, PUSH and POP Opcodes, programs, Data exchanges-Programs

UNIT – II	(10 Hours)

Logical and Arithmetic Operations (5h):

Introduction, Arithmetic instructions, incrementing and decrementing, Addition, subtraction, multiplication and division, decimal arithmetic-Programs, Byte level Logical instructions, Bit level logical instructions, Rotate and swap instructions, Programs

Jump and Call Instructions (5h):

The jump and call program range, jump and call instructions, machine cycle and time delays generation-Programs

UNIT – III	(10 Hours)

8051 I/O and Timer Programming (6h):

Introduction, I/O programming, I/O Bit Manipulation Programming.

Timers, programming timers 0 and 1 in 8051 assembly. Counter programming

8051 Serial Port and Interrupt Programming (4h):

Basics of serial communication, 8051 connections to RS-232, Serial port programming in 8051 assembly, Introduction to interrupts

UNIT – IV	(6L-6THours)

8051 Interfacing and Applications (5h):

Interfacing 8051 to LCD, parallel ADC0809, serial ADC MAX1112, DAC, Stepper motor

Programming in C for 8051(4h):

Introduction, Programming in C for 8051: data types, Programs on time delays, I/O programming,

Reference Books:

1. Digital Signal Processing Principle, algorithms and applications, 4th edition by Proakis, Pearson Education 2012
2. Kenneth J. Ayala, "The 8051 Microcontroller Architecture, Programming and Applications" 3rd edition, Cengage, 2007.
3. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; "The 8051 Microcontroller and Embedded Systems using assembly and C", 2nd edition, Pearson,

2012.

4. David Calcutt Fred Cowan, Hasan Parchizadeh Elsecier, "8051 Microcontrollers an application based introduction",2004
5. Myke Predko, "Programming and Customizing the 8051 Microcontroller", TMH, 1999, 15th Reprint, 2008.
6. Ajay V. Deshmukh; "Microcontrollers-Theory and Applications", TMH, 2005.
7. Ramani Kalpathi and Ganesh Raja, "Microcontroller and its applications", 1st revised edition Sanguine Technical publishers, Bangalore-2007.

Course Outcomes:

After completion of the course the students will be able to,

1. List and define the features of microcontrollers, instruction set, peripheral devices, addressing modes
2. Illustrate and explain architecture of microcontroller, functions of registers, pins, addressing modes, directives, programming instructions, interrupts, and peripheral devices
3. Identify the instructions/addressing modes, codes for selecting register banks/timer registers and to make use of appropriate instructions for programs and delay calculation Create, inspect & debug the assembly language instructions/program and re-correct code & assess number of bytes
4. Formulate the flowchart & develop assembly level/8051C programme for given application, Design, construct the interfacing circuit and develop programme with microcontroller 8051 for given application

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE652C.1	3	3	3	3	3	1	1	1	1	2	2	3	1	3	3
2	UEE652C.2	3	3	3	3	3	1	1	1	1	2	2	3	1	3	3
3	UEE652C.3	3	3	3	3	3	1	1	1	1	2	2	3	1	3	3
4	UEE652C.4	3	3	3	3	3	1	1	1	1	2	2	3	1	3	3

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE653H	Management and Entrepreneurship	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	10 Hours
1. Introduction: Management: Science, Theory and Practice, Managing; Science and Art? The Functions of Managers, Levels of management, the Systems Model of Management, Management and Society, Social Responsibility and Ethics. 2. Planning: The Nature and Purpose of Planning, Types of Plans, Steps in Planning, The planning Process, Objective, Management by Objectives, Strategies Policies, and planning Premises, The Strategic planning Process, Effective Implementation of Strategies, Premising and Forecasting, Decision Making the importance and Limitations of Rational Decision Making. Types of Decision making. 3. Organizing: The nature and Purpose of Organizing, Formal and Informal Organization, Organizational Division : The Department, Organization Level and the Span of Management, The Structure and Process of Organizing , Effective organizing, Basic Departmention, Matrix Organization Strategic Business Units, Line / Staff Authority and Decentralization of Authority and Power, Line and Staff concepts, Functional Authority, Decentralization of Authority , Delegation of Authority, Promoting and Appropriate Organization Culture.	
UNIT – II	**10 Hours**
4.Staffing : The System Approach to human Resource Management: An overview of the Staffing Function, Situational Factors affecting Staffing, Selection Process, Techniques and Instruments, Orienting and Socializing New Employees. 5.Motivation and Leading: Motivation : Meaning, importance, , Theories of motivation (Maslow's need theory, Expectancy theory, Alderffer's ERG, Two factor (hygiene) and Goal setting theory), Motivational Techniques. Leadership: Meaning, Ingredients of Leadership, Leadership Behaviour and Styles, Contingency Approaches to Leadership.	
UNIT – III	**10 Hours**
6.Communication Communication, The Communication Function in Organizations, The Communication Process, Communication in the Enterprise, Barriers and Breakdowns in Communication, Toward Effective Communication. 7.Controlling The System and Process of Controlling, Control as a Feedback System, Feed forward control, Requirements for Effective Controls, Control Techniques and information Technology Control Techniques: The Budget, Traditional Non budgetary Control, Information Technology, Productivity and Operation, Direct control versus Preventive Control.	
UNIT – IV	**10 Hours**
8.Entrepreneurship Meaning of Entrepreneur, Evaluation of the Concept, Functions of an Entrepreneur, Types of	

Entrepreneur, Intrapreneur - an Emerging Class, Concept of Entrepreneurship, steps in entrepreneurial process, Role of entrepreneurs in Economic Development; Entrepreneurship in India, Entrepreneurship — Barriers.

9.Micro Small and Medium Enterprises (MSME): Definition: Characteristics : Need and rational ; Objectives; Scope; role of MSME in Economic Development. Advantages of MSME, steps to start an MSME — government policy towards MSME; Impact of Liberalization, Privatization, Globalization MSME, Effect of WTO / GATT

10. Institutional Support: Diflerent Schemes: TITSOK, KIADB, KSSIDC, KSIMC, DIc Single window Agency ; MSME, NISC; SIDBI, KSFC.

11. Preparation of Project: Meaning of Project, Project Identification, Project Report Contents; Formulation; Project Appraisal Identification of Business Opportunities; Market Feasibility Studies; Technical Feasibility Studies; Financial Feasibility Studies and Social Feasibility Studies (in brief).

Reference Books:

1. Fremont E. Kast, James E Rosenzweig, Organization and Management, McGraw-Hill, 2nd Edition.
2. Tripati and Reddy, Principales of Management, TMH, 4th Edition, ISBN: 9780070220881, 2010.
3. Entrepreneurship Development – S. S. Khanka – S. Chand and Co.
4. Entrepreneurship Development – Small Business Enterprises - Poornima M. Charantimath – Pearson Eduction - 2006. 5th - Edition 2009..
5. David H.Holt, Entrepreneurship ; New Venture Creation, Prentice Hall, 1991, ISBN – 10:0132826747
6. Peter F Drucker - Innovation and Entrepreneurship, Harper Collins Publication, 1993, ISBN: 13:978-0-06-085113-2

Course Outcomes:

After completion of the course the students will be able to,

1. Students should be able to explore and apply the basic concepts of Management and apply the principles of management.
2. Students should be able to apply the entrepreneurial qualities and skill under real world practical conditions.
3. Students should be able to analyze the functions of management and entrepreneurship and apply them to practical situations.
4. Students should be able to ascertain various channels provided by government of India to initiate business enterprise.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE653H.1	3							1		1		1			1
2	UEE653H.2	3	1						1		1		1			1
3	UEE653H.3	3	3	2	2	1			1		1		1			2
4	UEE653H.4	3	3	3	3	1			1	1	1		2			2

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE654E	**Modern Control Theory**	**03 - Credits (3 : 0 : 0)**
Hours/Week : 03		**CIE Marks : 50**
Total Hours : 40		**SEE Marks : 50**

UNIT – I	**(10 Hours)**
State Variable Analysis and Design: Introduction, state space representation using physical variable, phase variable and canonical variables. **Derivation of transfer function from state model:** Diagonalization, Eigen values, Eigen vectors, Solution of state equations.	
UNIT – II	**(10 Hours)**
Solution State of Transition Matrix: Solution of state equation, state transition matrix and its properties, computation using Laplace transformation, power series method, Cayley- Hamilton method, concept of controllability and observability methods. **Pole Placement Techniques:** Stability improvements by state feedback, necessary and sufficient condition for arbitrary pole place placement	
UNIT – III	**(10 Hours)**
Design of Controllers: Introduction and Design of Proportional (P), Integral (I), Differential (D), PI, PD and PID **Design of Compensators:** Lead compensator, Lag compensator and Lag-lead compensator using frequency domain.	
UNIT – IV	**(10 Hours)**
Non-Linear Systems: Introduction behavior of non linear system common physical non-linearly - saturation, friction, backlash, dead zone, relay multivariable non linearity. Phase plane method singular points stability of nonlinear system. **Liapunov Stability Criteria:** Liapunov function, direct method of Liapunov and the linear system, Hurwitz criterion and Liapunov's direct method, construction of Liapunov functions for non linear system by Krasvskii's method.	
Reference Books: 1. Benjamin C. Kuo and Farid Golnaraghi, "Automatic Control Systems", VIII- edition, John Wiley and Sons, 2003. 2. Nagoor Kani, "Advanced Control Theory" 2nd Edition RBA Publications 2014. 3. Parvatikar K, "Modern control Theory" 1st Edition, PRISM Publications, 2016.	
Course Outcomes: After completion of the course the students will be able to, 1. Analyse both linear and nonlinear system using state space methods. 2. Compute eigen values & eigen vectors in state equation and Solve the Solution of state equation, state transition matrix and its properties. 3. Design the controller, compensators and state regulator observer using system parameters. 4. Analyze stability improvements by state feedback, state observer and Liapunov criteria.	

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE654E.1	3	3	3	1	3			1				2	1	3	1
2	UEE654E.2	3	3	3	1	2			1				2	1	3	1
3	UEE654E.3	3	3	3	1	3			1				2	1	3	1
4	UEE654E.4	3	3	3	1	3			1				2	1	3	1

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE656N	Fundamentals of Wind Energy Conversion Systems	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10L-0T Hours)
Introduction: Historical Development (BC – 20th Century); Historical Development (20th Century – 1980s); Recent Developments (1980s – present); The Nature of the Wind, origin of wind; Wind Energy Potential; Offshore Wind Energy; Modern Wind Turbines; Wind Vs Conventional power generation.	
UNIT – II	**(10L-0T Hours)**
Wind Resource Assessment: Introduction – Spatial variation, Time variation; Characteristics of steady wind; Weibull wind speed distribution function; Vertical profiles of steady wind; Wind rose; Energy content of wind; Resource assessment.	
UNIT – III	**(10L-0T Hours)**
Aerodynamics: Introduction; Aerofoil – Two dimensional theory ,Relative wind velocity, Stall control; Wind flow models – Wind flow pattern; Axial momentum theory; Momentum theory for rotating wake; Blade element theory, Strip theory; Tip losses and correction; Wind Machine Characteristics.	
UNIT – IV	**(10L-0T Hours)**
Wind Turbines: Introduction; Classification of Wind Turbines; Wind Turbine Components; Basic principles of wind energy extraction; Extraction of wind turbine power(Numerical problems)- Weibull distribution-Wind power generation curve-Betz's Law-Modes of wind power generation.	

Reference Books:

1. Siraj Ahmed, Wind Energy- Theory and Practice, Prentice Hall of India, New Delhi,2010
2. D. P. Kothari, S. Umashankar, Wind Energy Systems and Applications, Narosa publishers,2017
3. Khan B. H., Non-Conventional Energy Resources, Tata McGraw Hill, 2009.

Course Outcomes

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

1. list and define various parameters and features of wind energy conversion systems.
2. Explain various concepts and theory related to wind energy conversion systems.
3. Evaluate/calculate various parameters related to wind energy conversion systems.
4. Relate/articulate the concepts and theories related to wind energy conversion systems.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE656N.1	3	1	1				1	1		1		1	1	2	1
2	UEE656N.2	3	1	1				2	1		1		1	2	1	2
3	UEE656N.3	3	2	1				2	1	1	1		1	1	2	1
4	UEE656N.4	3	3	3				2	1		1		2	1	2	

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE661L	Microcontrollers and IoT Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

Part A - Assembly Language Programming

1. Addition of two 8 bit numbers, 16 bit numbers, array of 8 bit numbers, average of an array
2. Subtraction of two 8 bit numbers, 16 bit numbers
3. BCD Addition- two digit numbers, 4 digit numbers
4. Multiplication, Division
5. Arranging an array of number in ascending/descending order
6. To find maximum/minimum number of an array
7. Block of data transfer- Internal RAM, Internal RAM to external RAM
8. To find number of positive and negative numbers in an array
9. Code Conversion-BCD to Hex, Hex to BCD
10. Counters-Binary, BCD

Part B-IOT Programming

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface DISPLAY with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smart phone using Bluetooth
8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when I'/'O' is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to Thingspeak cloud
10. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from Thingspeak cloud
11. To install MySQL database on Raspberry Pi and perform basic SQL queries.
12. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker
13. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14. Write a program to create TCP server on Arduino Raspberry Pi and respond with humidity data to TCP client when requested.
15. Write a program to create UDP server on Arduino Raspberry Pi and respond with humidity data to UDP client when requested.

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Reference Books:

1. Kenneth J. Ayala, "The 8051 Microcontroller Architecture, Programming and Applications" 3rd edition, Cengage, 2007.
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; "The 8051 Microcontroller and Embedded Systems using assembly and C", 2nd edition, Pearson, 2012.
3. David Calcutt Fred Cowan, Hasan Parchizadeh Elsecier, "8051 Microcontrollers an application based introduction", 2004.

Course Outcomes:

After completion of the course the students will be able to:

1. Develop and verify Assembly Language Programes for the specified applications
2. Analyze and execute the Assembly Language Programes in Microcontroller kit
3. Interface and analyze the functioning of peripheral devices with microcontroller

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	**UEE661L.1**	**3**	**1**	**1**		**1**	**1**					**1**	**1**		**1**	**1**
2	**UEE561L.2**	**3**	**1**	**1**	**1**	**2**						**1**	**1**		**2**	**2**
3	**UEE561L.3**	**3**	**1**	**1**	**1**	**2**						**1**	**1**		**2**	**2**

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE662L	Electrical AutoCAD Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Installation and Basic Commands of Auto CAD package
2. Drawing the basic diagrams for familiarization with Auto CAD
3. Drawing the cross sectional elevation of XLPE cable
4. Drawing the line diagram of DOL and Star – Delta starter
5. Drawing the half sectional elevation of pin insulator
6. Drawing the single line diagrams of a substations for the specified incoming and outgoing components
7. Development and drawing of Simplex, Single layer Progressive Lap winding for DC machine with specified details
8. Development and drawing of Simplex, Single layer retrogressive Lap winding for DC machine with specified details
9. Development and drawing of Simplex, Double layer progressive Lap winding for DC machine with specified details
10. Development and drawing of Duplex, Single layer progressive Lap winding for DC machine with specified details
11. Development and drawing of Simplex, Single layer Progressive Wave winding for DC machine with specified details
12. Development and drawing of Simplex, Double layer Progressive Wave winding for DC machine with specified details
13. Development and drawing of Simplex, Single layer retrogressive Wave winding for DC machine with specified details
14. Drawing the layout of residential and workshop plans
15. Drawing the Assembly of single phase and three phase core type transformer
16. Drawing the Assembly of Rotor, Stator of DC Generator and Alternator Assembly domain specifications.

Reference Books:

1. Devalapur, S F, “Textbook of Electrical Drafting”, 7th Edition, Eastern Book Promoters, Belgaum, 2006
2. A.K. Sawhney, A Course in Electrical Machine Design, Dhanpat Rai & Co. (P) Limited (2017), ISBN-10: 8177001019, ISBN-13: 978-8177001013.
3. Mittle V.N., Arvind Mittal, Design of Electrical Machines, Standard Publishers Distributors (2009), ISBN-13: 978-81-8014-126-3, ISBN: 81-8014-126-8.

Course Outcomes:

After completion of the course the students will be able to:

1. Identify the tools and commands in the AutoCAD software
2. Draw and develop the engineering diagrams of the specified electrical components as per the proposed scale
3. Analyze the constructional details of electrical devices and components

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE662L.1	3	1	1		3	1					1	1	2	1	3
2	UEE562L.2	3	2	2	1	3	1					1	2	2	1	3
3	UEE562L.3	3	2	2	1	3	2					1	2	2		3

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UEE665P	Mini Project	02- Credits (0 : 0 : 4)
Hours/Week : 0L+4P		CIE Marks : 50
Total Hours : 48		SEE Marks : 50

Mini project is an important integral part of BE (E&EE) program. Mini project is outcome of 3 years of engineering program and is expected to test the learning skills of a student. It reflects quality of teaching-learning process in the department. Mini Project helps students to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. Mini Project will boost student's skills and widen their horizon of thinking. It acts like a beginners guide to do larger projects later in their career.

Course Outcomes

After undergoing the internship, students will be able to:

1. Identify engineering problems associated with electrical & electronics engineering and interdisciplinary research.
2. Analyze Data and interpret contemporary tools & resources to analyze / validate the solutions for engineering problems.
3. Communicate effectively and present the work to technical audience.
4. Prepare quality technical report with detailed analysis and representation of the executed work.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE665P.1	3			3					3			3	2	3	1
2	UEE665P.2		3	3		3	3						3	1	1	2
3	UEE665P.3	3	3	3	2	2	1				3		3	2	2	3
4	UEE665P.4	2	1								3		3	2	1	2

Syllabus for B.E. VI - Semester for academic year 2022 – 2023

(For students admitted to I year in 2020-21)

UHS003N	Career Planning & Professional Skills	01 - Credits (1 : 0 : 0)
Hours/Week : 01		CIE Marks : 50
Total Hours : 15		SEE Marks : 50

UNIT – I	(06 Hours)
Quantitative and Reasoning, Aptitude Skills Training: Number Properties, Percentages, Linear and Circular Arrangement Order and Rank	
UNIT – II	**(03 Hours)**
Verbal Aptitude Skills Training:- Reading Comprehension, Listening Comprehension, Concept Review	
UNIT – III	**(03 Hours)**
Career Skills:- Orientation to competitive exams, such as GATE, GRE, GMAT, CAT, UPSC, SSC, and Bank PO. Group Discussion – Simulation, Orientation to career paths, such as core engineering, IT engineering, public sector, banking, sales and marketing, and entrepreneurship	
UNIT – IV	**(03 Hours)**
Soft Skills: Six-Step Planning Process, Problem Solving through Design Thinking, Conflict Resolution through Assertiveness and Cooperation, Matrix, Confidence through Body Language & Preparing and Delivering a Presentation, Self-Motivation	

Reference Books:-

1. Master Guide, “Verbal Ability”, Ethnus Consultancy Services Pvt Ltd., 2018.
2. Master Guide, “Quantitative Aptitude”, Ethnus Consultancy Services Pvt Ltd., 2018.
3. Master Guide, “Verbal Ability”, Ethnus Consultancy Services Pvt Ltd., 2018.
4. Learner’s Notes, “Goal Setting”, Ethnus Consultancy Services Pvt Ltd., 2018.
5. Learner’s Notes, “Motivation”, Ethnus Consultancy Services Pvt Ltd., 2018.

Course Outcomes:-

After completion of the course the students will be able to,

1. Imbibe a high level of Think, decide and act according to the needs and demands of the current situation.
2. Fix the errors in coding by the various strategies of analytical and reasoning techniques
3. Clear the aptitude and general interviews by soft skills
4. Apply suitable soft skills in their career

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UHS003N.1	2	1	1		1	1	1		1	1	2	1			
2	UHS003N.2	2	1	1	1			1	1	2	1	1	1			
3	UHS003N.3	2	1	2	2			1	1	1	1	1	1			
4	UHS003N.4	2	1	3	3			1	1	1		2	2			

Syllabus for

B.E. VII - Semester

for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE751C	Computer Application to Power System	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)

Network Topology: Introduction, Elementary Graph Theory, connected graph, sub graph Loop, Cut-set, Tree, Co- tree, Basic loops, Basic cut-set. Incidence Matrices: Element-node incidence matrix A (Bus-incidence matrix), Branch path incidence matrix K, Basic (Fundamental) cut-set incidence matrix B, Augmented cut-set matrix, Basic loop incidence matrix C, Augmented loop incidence matrix

Primitive Network: General primitive element, Impedance and Admittance form of the primitive element, Primitive network matrices

Network Matrices: Introduction, Derivation of Y_{bus} = $[A][y][A]^T$, Formation of Y_{bus} by inspection method. Modeling: Transmission lines, Transformers, Loads and generator internal impedance. Examples

UNIT – II	(10 Hours)

Load Flow Studies: Introduction, Power Flow Equation, Classification of Buses, Operating Constraints, Data for Load Flow: System data, Generator bus data, Load Data.

Gauss-SeidalMethod: Algorithm for GS method, Modification of algorithm to include PV buses, Q- limit violations, Acceleration of convergence and examples.

Newton-Raphson Method: Introduction, Algorithm for NR method in polar coordinates and rectangular coordinates. Fast Decoupled Load Flow and examples.

UNIT – III	(10 Hours)

Economic Operations of Power System: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation including generator limits and neglecting losses, Iterative technique, Economic Dispatch Including Transmission Losses: Approximation penalty factor, Derivation of transmission loss formula. Introduction to optimal scheduling for hydrothermal plants. Problem formulation, solution procedure and algorithm

UNIT – IV	(10 Hours)

Transient Stability Studies: Introduction, swing equation, machine equations. Power system equations

Modeling: Modeling of excitation systems: Introduction, DC Excitation system, AC Excitation system. Type 1, Type 2 and Type 3 excitation. Load Model: Static, Dynamic load models

Reference Books:

1. Stag.G.W., and EI-Abaid,A.H.,"Computer Methodsin Power System Analysis", (2019 Edition), MEDTECH, A Division of Scientific International 2019.
2. K.UmaRao, "Computer Techniques and Model in Power Systems", 2nd edition, I.K.International, 2014.
3. Singh,L.P., "Advanced Power System Analysis and Dynamics", 6th edition, New Age International(P) Ltd, NewDelhi, 2014.
4. Nagrath,I.J., and Kothari, D.P., "Modern Power System Analysis", 4th edition, TMH, 2011.
5. Pai.,M.A., "Computer Techniques in Power System Analysis", 2nd edition, TMH, 2006.

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Course Outcomes:

After completion of the course the students shall be able to,

1. Recall/define network topology concepts, primitive network, types of buses, load flow studies, economic scheduling and transient studies in power systems.
2. Illustrate/describe need for network topology, primitive network, Y_{bus}, types of buses, load flow studies, optimal scheduling of thermal power plants, transient stability of power systems and computer model of DC excitation systems.
3. Derive Y_{bus}, Z_{bus}, load flow algorithms by different methods, necessary condition of economic scheduling of thermal generators and swing equations for transient stability of power systems.
4. Determine power system parameters using network topology, real and reactive power flow, optimal scheduling of thermal generators, solve swing equations and decide the suitable methods for economic scheduling for thermal generators.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE751C.1	3							1		1		1	2	1	
2	UEE751C.2	3	1						1		1		1	1	2	1
3	UEE751C.3	3	3	2	2	1			1		1		1	3	1	1
4	UEE751C.4	3	3	3	3	1			1	1	1		2		1	

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE752C	High Voltage, Switchgear & Protection	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)

Generation of HV AC and DC Voltage: L-06 Hours

Classification of high voltages, HVAC-transformer, Need for cascade connection, working of transformer units connected in cascade, Series resonant circuit – principle of operation and advantages, Tesla coil. HV – DC voltage doublers circuit, Cock croft – Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop, Important applications of high voltages.

Generation of Impulse Voltage and Current: L-04 Hours

Introduction to standard lightning and switching impulse voltages. Analysis of single -stage impulse generator, expression for output impulse voltage. Multistage impulse generator, working of Mark impulse generator, Rating of impulse generator, Components of multistage impulse generator.

UNIT – II	(10 Hours)

Measurement of High Voltages: L-05Hours

Electrostatic voltmeter – principle, construction and limitation. Chubb and Fortessue method for HVDC measurements. Series resistance micro ammeter, Standard Sphere gap measurements for HVAC, HVDC and factors affecting the measurements.

Insulation Testing Techniques: L-05Hours

Dielectric loss and loss angle measurement using Schering Bridge, Transformer ratios arm bridge, Breakdown in solid dielectrics: Intrinsic breakdown, Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown(bubble's theory)

UNIT – III	(10 Hours)

Protective Relaying: L-05 Hours

Relay definition, Required qualities of Protective Relaying, Primary and Back up protection, Classification of protective Relaying, Induction type Non-directional over current relay, Directional relay. Differential relay- Principle of operation, Percentage Differential relay, Distance relays: Impedance Relay, Reactance Relay, Mho Relay, R-X diagram and Buchholz Relay.

Protection Schemes: L-05 Hours

Merz-Price protection for generator, Merz -Price protection of Transformer. Inter turn fault, Induction motor protection-Protection against phase fault, ground fault and single phasing.

UNIT – IV	(10 Hours)

Static Relays :L-05 Hours

Introduction, Basic construction and classification. Definite time lag static over current relay, Inverse time static over current relay, Static over voltage and under voltage relay, Microprocessor based over current relay-block diagram approach.

Principles of Circuit Breakers : L-05 Hours

Principles of AC circuit breaking, Principles of DC circuit breaking, Initiation of arc, maintenance of arc, Arc interruption- High resistance and Low resistance interruption. Re striking voltage, Recovery voltage and resistance switching. Types of circuit breakers- Air break and air blast circuit breakers, SF6 circuit breakers- Puffer type and Non Puffer type.

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Reference Books:

1. Sunil S. Rao "Switchgear and Protection and Power Systems", (13th edition),Khanna Publishers,2008
2. J. B. Gupta "Switchgear and Protection", (2nd edition), Katson Publisher, 2013
3. Ravindarnath B. "Power System Protection and Switchgear", 2nd edition, New age International, 2008.

Course Outcomes:

After completion of the course the students will be able to,

1. Select suitable generating and measuring instrument for testing high voltage equipment's.
2. Estimate the ripple factor, maximum voltage and relay timing for different high voltage instruments.
3. Compare the different insulating material, protection equipment's for high voltage applications
4. Apply the suitable protection equipments for selected rating of current and voltage ratings

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE752C.1	3	1		1	3	1		1		1		1	1	2	1
2	UEE752C.2	3	2	1	1				1		1		1	1	2	1
3	UEE752C.3	3	3	2	2	1			1		1		1	1	2	2
4	UEE752C.4	3	3	3	2	1			1	1	1	1	2	1	1	3

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UHS753C	Intellectual Property Rights	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)
Introduction to IPRS: Importance of human creativity and its recognition and protection. Concepts of Property and Rights. Different forms of IPRs. Role of IPRs in R&D. **Patents**: Meaning of Patent, Objectives and Value of Patent. Criteria for Patentability. Software and Business Methods Patents. Govt. use of inventions, infringement of Patent and remedies for infringement. Compulsory license.	
UNIT – II	**(10 Hours)**
Prior art Searching: Prior art- Tangible versus Intangible prior art. Search strategy: key words, structures, sequences, use of operators, database for searching- free and paid, disclosed versus claimed matters. **Patent Drafting:** Types of specification, descriptions, drawing, claim drafting. **Filing Requirement of patent**: Work flow chart in obtaining Patents, Forms to be submitted, filing mechanism through Individual patent office and PCT route. Request for re - examination and revocation. Term of Patent and Patent renewal.	
UNIT – III	**(10 Hours)**
Trade-Marks: Meaning and functions of Trade Marks. Concept of Distinctiveness and Trade Marks registration. Trade Marks- Challenges in Non- Conventional Marks. Infringement of Trade Marks and remedies for infringement. Domain names and Trade Names. **Industrial Design**: Definition of a design. Inclusive and Exclusive Designs; Industrial Design registration in India. Infringement of Design and remedies for infringement.	
UNIT – IV	**(10 Hours)**
Copyright: Nature of Copyright, Subject-matter, Requirements to protect Copyright under the Law, Neighboring/Related Rights. Authorship rights. Copyright in the Digital Context. Transfer of Copyright and Infringement and remedies. Fair dealing and online streaming. **Confidential Information and Trade Secrets**: Introduction, Conditions of protection. Essentials for an action for breach of confidence.	

Reference Books:

1. P. Naryan, "Intellectual Property Law", 3rd Ed, Eastern Law House, 2007.
2. Dr. S. R. Myneni, "Law of Intellectual Property", 9th edition, Asia law House, 2019.
3. Dr. G. B Reddy, "Intellectual Property Rights and Law", Gogia Law Agency. Hydrabad, Reprint edition 2020.
4. N.R. Subbaram., S.Viswanathan, "Hand book Indian Patent Law and, Practice" Printers and publishers Pvt., Ltd, 2008.
5. Cornish, "Intellectual Property Rights", Universal publications.
6. Dr. B. L. Wadehra, "Law Relating to Intellectual Property" 5th edition, Universal Law publishing Co, Dehli.
7. SWAYAM / NPTL/ MOOCS/ We blinks/ Internet sources/ YouTube videos and other materials / notes

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Course Outcomes:

After successful completion of this course the student should be able to:

1. Identify criteria to fit one's own intellectual work in particular form of IPRs.
2. Apply statutory provisions and procedure to protect different forms of IPRs at national and international level.
3. Analyze rights and responsibilities of holder of Patent, Copyright, Trademark, Industrial design etc.
4. Develop skill of making search using modern tools and techniques.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UHS753C.1						3									
2	UHS753C.2			2		1	2	2	2		2		2			
3	UHS753C.3						3	2	2		2		1			
4	UHS753C.4					2				1	1		2			

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE754E	Solar Photovoltaic System Design	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)
Chapter-01: Solar Energy – Introduction and its scenario of India and global; Solar Radiation – solar radiation spectrum, diffuse & beam radiation and solar radiation measurement. **Chapter-02:** Solar Cells – I-V & P-V characteristics; Technologies; Parameters; Factors affecting electricity generated; series, parallel and series & parallel connections; Numerical problems.	
UNIT – II	**(10 Hours)**
Chapter-03: SPV module – Ratings, standard parameters; factors affecting electricity generated; I-V & P-V characteristics; connection of modules in series, parallel and series & parallel; Mismatch in series and parallel connections, Introduction to arrays. **Chapter-04:** Balance of System (BoS) - Batteries; Charge Controllers; MPPT; Inverters. (BoS to cover functions, working, types, features, typical specifications and cost). Numerical problems.	
UNIT – III	**(10 Hours)**
Chapter-05: Wires – Introduction, basics of current conduction, types of wires, measurement of wire dimensions, wire sizing; junction box; **Chapter-06:** Introduction – stand-alone, grid connected & hybrid solar PV power systems; Installation, Maintenance, Troubleshooting and Safety of SPV power plants; Solar PV plant installation check list. Islanding – Definition, Causes. Types and Protection. Field visits within campus to study installations.	
UNIT – IV	**(10 Hours)**
Chapter-07: Introduction – Configurations of SPV systems, SPV system design and integration – Design Methodology for Stand-alone SPV systems. **Chapter-08:** Grid connected Solar PV Power Systems (GCSPVPS) – Introduction, Configurations & Components of GCSPVPS, GCSPVPS Design for small applications and for power plants.	
Reference Books: 1. Chetan Singh Solanki, Solar Photovoltaics – Fundamentals, Technologies and Applications, PHI Learning Private Limited, New Delhi, 2009 2. Chetan Singh Solanki, Solar Photovoltaic Technology and Systems – A Manual for Technicians, Trainers and Engineers, PHI Learning Private Limited, New Delhi, 2014 3. M S Imamuaa and P. Helm Photovoltaic System Technology A European Hand book. 4. Tiwari, G. N and Ghosal, M. K., Fundamentals of Renewable Energy Sources, Narosa Publishing House, New Delhi, 2007	
Course Outcomes: After successful completion of this course the student will be able to: 1. Define parameters, components & features of solar cell, module, panel, array and SPV systems. They should be able to describe installation, O&M, troubleshooting and safety aspects of SPV systems, 2. Compute/estimate performance of SPV systems for different loads and applications	

based on numerical problems.

3. Compare and analyze output of different solar PV systems.
4. Operate, test, design & discuss a solar PV system – stand alone or grid connected – based on typical loads

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE754E.1	3	1		1	3	1		1		1		1	1	2	1
2	UEE754E.2	3	2	1	1				1		1		1	1	1	3
3	UEE754E.3	3	3	2	2	1			1		1		1	1	1	1
4	UEE754E.4	3	3	3	2	1			1	1	1	1	2	1	3	1

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UHS732N	Electrical Safety for Engineers	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)
Introduction to Electrical Safety, Electric Shocks and their Prevention: OSHA standards on electrical safety, objectives of safety and security measures, hazards associated with electric current and voltage, principles of electrical safety, approaches to prevent accidents, review of IE rules & acts. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns	
UNIT – II	**(10 Hours)**
First Aid in Case of Electric Shock: First principles of actions after electric shock, first aid-artificial respiration methods, Cardiac Pulmonary Resuscitation, accident management and safety management. **Equipment Earthing and System Neutral Earthing:** Earthing, need for earthing, types of earthing, distinction between system grounding and equipment grounding, functional requirement of earthing system, technical consideration of station earthing system, step and touch potential, neutral grounding and its advantages	
UNIT – III	**(10 Hours)**
Safety in Residential, Commercial and Agricultural Installations: Domestic wiring methods and installations, safety requirements, shocks from domestic equipment-water taps- wet walls-agricultural pumps, types of cables and specifications, underground cables, best practices with use of electricity. **Accident Investigation:** Why and how to investigate, investigation report writing. Case studies of accidents in HESCOM/GESCOM region	
UNIT – IV	**(10 Hours)**
Electrical System Safety: Safety devices and their characteristics, safety clearances and creepage distances in electrical plants, line supports, insulators Circuit Breakers: Arc phenomenon, principles of arc extinction, oil & air blast breakers Protective Relays: Fundamental requirements of relaying, classification of relays Protection of Alternators, Transformers, Bus bars and Lines, protection against over voltages	
Reference Books: 1. S. Rao., R. K. Jain., H.L. Saluja., "Electrical safety, fire safety Engineering and safety management", Khanna Publishers New Delhi,2nd Edition, 2021 2. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997. 3. V. K.Mehta, Rohit Mehta, "Principles of Power Systems", S Chand Publications, 4th Edition, 2008. 4. The Electricity Act, 2003, https://cercind.gov.in/Act-with-amendment.pdf	

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Course Outcomes:

After successful completion of this course the student will be able to:

1. List and explain the objectives and security measures in electrical safety systems
2. Illustrate approaches to prevent accidents in electrical systems and describe the operation of safety devices
3. Suggest the methods to rescue & first aid approaches in case of electrical accidents
4. Assess & provide solutions to a practical case study and write an investigation report with independent conclusions.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UHS753C.1	2	1		1		1		1		1		1			
2	UHS753C.2	2	2	1	1				1		1		1			
3	UHS753C.3	2	2	2	2				1		1		1			
4	UHS753C.4	2	2	2	2				1	1	1	1	2			

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE761L	Power System Simulation Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. ABCD parameters for short and medium network of transmission lines.
   a. Verification of Symmetry and Reciprocity of the network.
   b. Determination of regulation and efficiency.
2. To determine fault currents and voltages in a single line systems with star- delta transformers at a specified location for SLGF, DLGF, LL and check boundary conditions.
3. YBus formation of power systems with and without mutual coupling by singular transformation and inspection method.
4. Determination of power angle diagrams for salient and non-salient pole synchronous m/cs, reluctance power, excitation emf and regulation.
5. Determine stability of power system using Swing equation. To determine critical clearing time for SMIB system by varying inertia constant, line parameters/fault location.
6. Write a program to perform load flow study using Gauss-Seidel method (only pq Bus not exceeding 4-buses).
7. Formation of Jacobian matrix for a given power system not exceeding 4 buses in polar Coordinates (no PV buses).
8. Write a program to perform load flow study using Fast-Decouple Load Flow Method
9. Optimal Generator Scheduling for Thermal power plants connected to load dispatch center.

Reference Books:

1. Stag.G.W., and EI-Abaid,A.H., “Computer Methods in Power System Analysis”, (2019 Edition), MEDTECH, A Division of Scientific International 2019.
2. K.UmaRao, “Computer Techniques and Model in Power Systems”, 2nd edition, I.K.International, 2014.
3. Singh,L.P., “Advanced Power System Analysis and Dynamics”, 6th edition, New Age International(P) Ltd, New Delhi, 2014.

Course Outcomes:

After completion of the course the students shall be able to:

1. Identify and formulate the electrical network parameters for load flow analysis using electrical topology
2. Model and simulate the steady state analysis of power system network
3. Evaluate generator scheduling and economic load dispatch in power plant

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE761L.1	3	1	1		1	1					1	1	3		2
2	UEE761L.2	3	1	1	1							1	1	3		2
3	UEE761L.3	3	1	1	1							1	1	2		2

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE762L	High Voltage and Relay Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Operating characteristics of static Under/Over Voltage relay.
2. Operating characteristics of Microcontroller over voltage relay (DMT and IDMT)
3. Operating characteristics of Electro-Mechanical over current relay.
4. Operating characteristics of Electro-Mechanical Earth fault relay.
5. Operating characteristics of Microcontroller over current relay (DMT and IDMT).
6. Operating characteristics of Numerical Under / Over voltage relay (DMT and IDMT).
7. Operating characteristics of static Over Current relay (DMT).
8. Break down strength of transformer oil.
9. Experiment on field plotting using electrodes.
10. Measurement of high AC and DC voltage using Sphere-gap.
11. Flash-over characteristics of uniform and non-uniform Gaps for HVAC
    a. Plane-Plane Electrodes (Uniform field)
    b. Point-Plane Electrodes (Non-uniform field)
12. Flash-over characteristics of Uniform and non-uniform fields for Direct high voltage
    a. Plane-Plane Electrodes
    b. Point positive, Plane negative
    c. Point negative, Plane positive

Reference Books:

1. Sunil Rao "Switchgear and Protection and Power Systmes", (13th edition),Khanna Publishers,2008
2. J.B.Gupta "Switchgear and Protection", (2nd edition), Katson Publisher,2013.
3. Ravindarnath B. "Power System Protection and Switchgear", 2nd edition, New age International, 2008.

Course Outcomes:

After completion of the course the students shall be able to:

1. Test the breakdown strength of various insulating material by different methods.
2. Select the appropriate relays for different current ratings based on their characteristics.
3. Estimate the flash over characteristics for uniform and non-uniform fields for high voltage applications.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE762L.1	3	1	1		1	1					1	1	1	2	1
2	UEE762L.2	3	1	1	1							1	1	1	1	1
3	UEE762L.3	3	1	1	1							1	1	1	2	3

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE764I	Internship	02 - Credits (0 : 0 : 2)
Hours/Week :		CIE Marks : 70
Total Hours :		SEE Marks : 30

All the students have to undergo mandatory internship/training in any one of the reputed industry/ research institute. The training program has to be taken up during the vacation between 6th and 7thsemester. The duration of the training program should be for period of 4 weeks. A report on the training is to be submitted. The supervisor/ guide from industry shall allot 70 marks of the CIE and the other 30 by the internal evaluation committee. SEE evaluation will be made by a committee comprising of HoD as Chairman/his nominee, internship coordinator and a senior faculty. The SEE will be a Technical Seminar on the industrial training.

Course Outcomes

After undergoing the internship, students shall be able to:

1. Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.
2. Operate the systems/ devices independently and tabulate the experimental results in consultation with supervisor.
3. Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.
4. Analyze the real time functioning of internship organization.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE764I.1	1	1			2						2		2	1	2
2	UEE764I.2	1	1			2	1		1		2	2		3	1	2
3	UEE764I.3	1				1	1					2		2		1
4	UEE764I.4	1							1	3	3	2		2		1

Syllabus for B.E VII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE765S	Technical Seminar	01 - Credits (0 : 0 : 2)
Hours/Week : 08		CIE Marks : 50
Total Hours :		SEE Marks : 50

Technical seminar is an important integral part of BE (E&EE) program. Seminar is outcome of 4 years of engineering program and is expected to test the learning skills of a student. It reflects quality of teaching-learning process in the department. Seminar work will remain as an epitome of your entire professional career.

Seminar should be based on thrust areas in state of art technologies. Students should identify the topic of seminar and finalize in consultation with coordinator. Students should understand the topic and compile the report in standard format and present in front of Panel of Examiners respective Programme.

Course Outcomes

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

1. Enhance the knowledge on engineering problems associated with electrical & electronics engineering and interdisciplinary research.
2. Data analysis and interpretation of contemporary tools & resources to analyze / validate the solutions of engineering problems
3. Communicate effectively to meet the technical seminar requirements and present the work to technical audience.
4. Prepare quality technical report with detailed analysis and representation of selected topic.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE765S.1	3	3						3	3	3	1	3	1	1	1
2	UEE765S.2	3	3		2		2		3	3	3	2	2	1	1	2
3	UEE765S.3	3	3	3	3	3	3	1	3	3	3	3	3	2	1	1
4	UEE765S.4	1	1	2					3	3	3	1	2	2	2	3

Syllabus for

B.E. VIII - Semester

for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Syllabus for B.E VIII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE851E	Power System Operation and Control	03 - Credits (3 :0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)
Automatic Generation Control: Introduction, Control loops of power systems, Modeling of Automatic Voltage Regulator (AVR), performance AVR, modeling of Automatic Load Frequency Control (ALFC) of single area systems, performance of AVR, ALFC of two area systems, expression for tie-line flow and frequency deviation, tie-line bias-control, area control error and parallel operation of generators	
UNIT – II	**(10 Hours)**
Control of Voltage and Reactive Power: Introduction, generation and absorption of reactive power, relation between voltage, power and reactive power at nodes, methods of voltage control: Shunt reactor, shunt capacitor, series capacitor, tap changing transformer and booster transformer Compensating Devices-Characteristics of SVC, TCR, TSC and STATCOM. voltage stability, PV and QV curves, voltage collapse, prevention of voltage collapse	
UNIT – III	**(10 Hours)**
Unit Commitment: Statement of the problem, need and importance of unit, constraints in unit commitment, spinning reserve, Thermal Unit Constraints, Other constraints, Hydro constraints, Must Run, Fuel constraints, Unit commitment Solution methods: Priority-List methods, Dynamic Programming solution. Reliability Considerations, Patton's Security Function, Security constrained Optimal Unit Commitment, Start-up considerations, Optimal Generation Scheduling reliability in Unit commitment	
UNIT – IV	**(10 Hours)**
Power System Security: Introduction, factors affecting power system security, power system contingency analysis, detection of network problems, network sensitivity methods, calculation of network sensitivity factor, contingency ranking **Power System State Estimation:** Introduction, power system state estimation, maximum likeli-hood weighted least-square estimation, maximum likeli- hood concept with example, matrix formulations, Detection and Identification of bad measurements	

Reference Books:

1. Woodand BAJF Wallenberg, “Power Generation, Operation and Control”, 2nd Edition, John Wiley and Sons, 2007.
2. G.L. Kusic, “Computer Aided Power System Analysis”, 2nd edition, PHI, 1992.
3. T.J.E Miler, “Reactive Power Control in Electric Power Systems”, John Wiely and Sons NY,1982.
4. Nagrath,I.J., and Kothari,D.P, “Modern Power System Analysis”, (4th edition),TMH,2014.
5. Prabha Kundur, “Power System Stability and Control”, 9th reprint, TMH, 2009.

Course Outcomes:

After completion of the course the students will be able to,

1. Develop the model of AVR and ALFC applied to the thermal generators in-order to regulate the frequency and terminal voltage.
2. Asses the performance of compensating devices, AVR, ALFC and summarize in terms

of stability issues.

3. Identify various compensating device and design the compensating devices applied to power systems.
4. Develop the unit commitment table and find the optimum combination of thermal generators for supplying the demand.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE851E.1	3							1		1		1	1	2	1
2	UEE851E.2	3	1						1		1		1	2	1	
3	UEE851E.3	3	3	2	2	1			1		1		1	1	3	1
4	UEE851E.4	3	3	3	3	1			1	1	1		2	1	1	

Syllabus for B.E VIII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE852E	Energy Conservation, Audit and Demand Side Management	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10 Hours)
Energy Scenario: Introduction to Energy; Units and Conversions; GDP, GNP and Per Capita Energy Consumption; Renewable Energy Act, International Energy Agency, OECD and Kyoto Protocol (only overview) **Economic Analysis of Energy:** Economic analysis of investment, Cash Flows and CF diagrams, Economic analysis technique – Simple payback period method, Discounted cash flow method or Time adjustment technique, Net present value method, Present value index method or Profitability index method, Internal rate of return method, Accounting on average rate of return method; Interest Factors – Single Payment Compound Amount **(SPCA),** Single Payment Present Worth (**SPPW**), Uniform Series Compound Amount (**USCA**), Sinking Fund Payment (**SFP**), Uniform Series Present Worth (**USPW**), Capital Recovery (**CR**). **(**Simple Numerical problems**).**	
UNIT – II	**(10 Hours)**
Motors: Introduction, Motor Characteristics - Speed, Slip & Efficiency, Motor Selection; Determination of energy saving, Energy saving options in oversized motors, Effect of variation of voltage on performance of motor, Effect on efficiency due to variation in load; Energy Efficient Motors, Choice of energy efficient motor, Factors Affecting Energy Efficiency, Rewinding Effects on Energy Efficiency, Standards and Star Labeling of Energy Efficient Induction Motors. **Lighting:** Introduction, Terms and definitions – Lumen, Lux, Load efficacy, Lamp circuit efficacy, Color rendering index (**CRI**); Characteristic of different types of lamps. Energy saving opportunities in lighting. Criteria for Energy Efficient Lighting. Designing Lighting system – Indoor and Outdoor. Effect of reduction in supply voltage on energy consumption. Timers and occupancy sensors.	
UNIT – III	**(10 Hours)**
Energy Management and Audit: Energy management; Developing energy use profiles; Sankey Diagram; Process flow diagrams; Material and energy balance; Energy auditing instruments. Energy audit – Need for energy audit, Scope of energy audit, Types of energy audit – Preliminary energy audit, Detailed energy audit;	
UNIT – IV	**(10 Hours)**
Energy Conservation: Introduction, Results of energy conservation, Principles of energy conservation, Energy conservation planning, Energy conservation Act,; Energy conservation in residential and commercial sectors, Energy conservation in transportation, considerations for Energy conservation in industry, Energy conservation in electricity generation, transmission and distribution, Energy conservation in agricultural sector. **Demand Side Management:** Introduction to DSM – Definition, Evolution, Benefits and Scope; Role of Energy Companies, Load Management, Application of Load Control, DSM Implementation Issues, Strategies to implement and Promote DSM, Customer acceptance of DSM, Environment & DSM, International experience with DSM, DSM in India.	

Syllabus for B.E VIII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Reference Books:

1. Suresh Kumar Soni and Manoj Nair, Energy Conservation and Audit, Satya Prakashan, New Delhi, 2010
2. Rajiv Shankar, Energy Auditing in Electrical Utilities, Viva Books, New Delhi 2010
3. Larry C. White, Philip S. Schmidt, David R. Brown, "Industrial Energy Management Systems", Hemisphere Publishing Corp, New York.
4. Albert Thumann, "Fundamentals of Energy Engineering", Prentice Hall Inc, Englewood Cliffs, New Jersey.

Course Outcomes:

After completion of the course the students will be able to,

1. Define/list different energy resources, energy management/audits, energy efficient motors, lighting terminologies and demand side management terminologies.
2. Describe/explain energy economic methods, energy audit methods, lighting criteria and DSM techniques
3. Compute/determine numerical problems and compare & contrast on selection of energy economic techniques, lighting criterion, energy efficient motors and energy alternative from DSM techniques
4. Evaluate various methods of energy conservation & DSM in different sectors like agriculture, commercial, transpiration and domestic and design & develop methods/techniques for energy conservation, audit & management

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE852E.1	3							1		1		1	1	1	1
2	UEE852E.2	3	1						1		1		1	1	1	1
3	UEE852E.3	3	3	2	2	1			1		1		1	1	2	3
4	UEE852E.4	3	3	3	3	1			1	1	1		2	1	1	3

Syllabus for B.E VIII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE853E	Smart Grid	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours :40		SEE Marks : 50

UNIT – I	(10LHours)
Smart Grid Architectural Designs: Introduction, Today's Grid versus the Smart Grid, Energy Independence and Security Act of 2007: Rationale for the Smart Grid, Computational Intelligence, Power System Enhancement, Communication and Standards, Environment and Economics, General View of the Smart Grid Market Drivers, Stakeholder Roles and Function, Working Definition of the Smart Grid Based on Performance Measures, Representative Architecture, Functions of Smart Grid Components. **Smart Grid Communications and Measurement Technology:** Communication and Measurement, Monitoring, PMU, Smart Meters, and Measurements Technologies, GIS and Google Mapping Tools, Multiagent Systems (MAS) Technology, Microgrid and Smart Grid Comparison. **Performance Analysis Tools for Smart Grid Design:** Introduction to Load Flow Studies, Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods, Load, Flow State of the Art: Classical, Extended Formulations, and Algorithms, Congestion Management, Effect, Load Flow for Smart Grid Design, DSOPF Application to the Smart Grid.	
UNIT – II	**(10L Hours)**
Network Theorems: Introduction to Stability, Strengths and Weaknesses of Existing Voltage Stability Analysis Tools, Voltage Stability Assessment, Voltage Stability Assessment Techniques, Voltage Stability Indexing, Analysis Techniques for Steady-State Voltage Stability Studies, Application and Implementation Plan of Voltage Stability, Optimizing Stability Constraint through Preventive Control of Voltage Stability, Angle Stability Assessment. **Computation Tools for Smart Grid:** Introduction to Computational Tools, Decision Support Tools, Optimization Techniques, Classical Optimization Method, Heuristic Optimization, Evolutionary Computational Techniques, Pareto Method.	
UNIT – III	**(10L Hours)**
Pathway for Designing Smart Grid:: Introduction to Smart Grid Pathway Design, Barriers and Solutions to Smart Grid Development, Solution Pathways for Designing Smart Grid Using Advanced Optimization and Control Techniques for Selection Functions, General Level Automation, Bulk Power Systems Automation of the Smart Grid at Transmission Level, Distribution System, Automation Requirement of the Power Grid, End User/Appliance Level of the Smart Grid, Applications for Adaptive Control and Optimization. **Renewable Energy and Storage:** Renewable Energy Resources, Sustainable Energy Options for the Smart Grid, Penetration and Variability Issues Associated with Sustainable Energy Technology, Demand Response Issues, Electric Vehicles and Plug-in Hybrids, PHEV Technology, Environmental Implications, Storage Technologies, Tax Credits.	
UNIT – IV	**(10L Hours)**
Interoperability, Standards, and Cyber Security: Introduction, Interoperability, Standards, Smart Grid Cyber Security, Cyber Security and Possible Operation for Improving Methodology for Other Users.	

Syllabus for B.E VIII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

Research, Education, and Training for the Smart Grid: Introduction, Research Areas for Smart Grid Development, Research Activities in the Smart Grid, Multidisciplinary Research Activities, Smart Grid Education, Training and Professional Development.

Case Studies and Test beds for the Smart Grid:

Introduction, Demonstration Projects, Advanced Metering, Microgrid with Renewable Energy, Power System Unit Commitment (UC) Problem, ADP for Optimal Network Reconfiguration in Distribution Automation, Case Study of RER Integration, Testbeds and Benchmark Systems, Challenges of Smart Transmission, Benefits of Smart Transmission.

Reference Books:

1. James Momoh., "Smart Grid, Fundamentals of Design and Analysis", (1st Edition), Wiley, 2012.
2. Clark W Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.
3. Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications"- Wiley, 2012.

Course Outcomes:

After completion of the course the students will be able to,

1. Identify the smart measuring instruments for two way communication of each components in grid.
2. Apply the suitable load flow analysis technique for exiting distribution system.
3. Evaluate the optimal value for distribution system including renewable energy and storage systems.
4. Formulate the existing distribution for the conversion to smartgrid using standards as for the case studies.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE853E.1	3	1		1	3	1		1		2		1	1	3	1
2	UEE853E.2	3	2	1	1				1		1		1	1	2	3
3	UEE853E.3	3	3	2	2	1			1		1		1	1	2	1
4	UEE853E.4	3	2	3	2	1			1	1	1	1	2	1	3	2

Syllabus for B.E VIII - Semester for academic year 2023 – 2024

(For students admitted to I year in 2020-21)

UEE871P	Project Work	13 - Credits (0 : 0 : 26)
Hours/Week : 26		CIE Marks : 50
Total Hours : 260		SEE Marks : 50

	(0L-0T-26P Hours)
Students have to take up Design methodology and planning of project work, Description of Concepts and Technical Details, Incorporation of Suggestions made by examiners during CIE and prepare the project implementation schedule. A certified report with project demonstration and a seminar is to be presented by the students. The seminar should highlight – Broad project area of their project work carried out. CIE of 50 marks will be allotted by the examiners as per the rubrics. For SEE, student has to make a presentation of the work carried out to Project Evaluation Committee (PEC- Project coordinator, Internal Examiner, External Examiner). PEC will allot SEE marks for 50.	

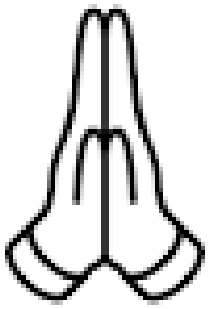
Course Outcomes

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

1. Identify, formulate & analyze the engineering problems associated with electrical & electronics engineering and interdisciplinary research.
2. Design & implement proposed solutions for complex engineering problems to meet specified objectives by analyzing / validating the design / solutions of engineering problems using contemporary tools & resources.
3. Prepare engineering documents and make effective presentation to communicate effectively and collaboratively with detailed analysis and interpretation of results to yield valid conclusions.
4. Demonstrate social, ethical cultural & engineering professional responsibilities.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	UEE871P.1	3	3						3	3	3	1	3	3	3	3
2	UEE871P.2	3	3		2		2		3	3	3	2	2	3	3	3
3	UEE871P.3	3	3	3	3	3	3	1	3	3	3	3	3	3	3	3
4	UEE871P.4	1	1	2					3	3	3	1	2	3	3	3



Thank You

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