Syllabus for

B.E. III - Semester

for academic year 2022 – 2023

(For students admitted to I year in 2021-22)

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

(For students admitted to I year in 2021-22)

21UMA303C	Computation Techniques for Electrical Systems - I	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.
Introduction: Definitions of signals and systems, Classification of signals, Elementary signals, Basic operations on signals, Properties of systems.	
UNIT – II	**10 Hrs.**
Time-domain representation for LTI systems: Convolution, Impulse response representation, Properties of impulse response representation, Block diagram representations	
UNIT – III	**10 Hrs.**
Z-Transforms: Introduction, Z transform, Properties of ROC, Properties of the Z - transform, Inverse Z - transform, Partial fraction expansion method, Transfer function, Causality and Stability	
UNIT – IV	**10 Hrs.**
Fourier Analysis of Continuous Time Periodic and Aperiodic signals: Introduction, Properties of continuous-time Fourier series (Excluding derivation of defining equations for CTFS), Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on properties of Fourier series and Fourier transform.	

References:

1. Simon Haykin and BaryVam Veen, "Signals and Systems," John Wiely and Sons, 2nd Edition, 2014.
2. H P HSU, "Signals and Systems," Schaums Outline, TMH, 2nd Edition, 2011.
3. Michael Roberts, "Fundamentals of Signals & Systems", 2nd Edition, Tata McGraw-Hill, 2010
4. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd Edition, 2013.
5. Ganesh Rao, Satish Tunga, "Signals and Systems", Sanguine Technical Publishers, 2nd Edition, 2020.

Course Outcomes:

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

1. Represent signals and perform the basic operations on signals and to identify systems properties on causality, stability, memory, linearity and time invariance
2. Illustrate- Continuous time systems and discrete time system by performing Convolution in LTI system with properties of impulse response
3. Analyze and Derive the Z transforms and properties of Z transform by using the concept of ROC
4. Determine Fourier series and properties of Fourier series in CTFS and CTFT signals

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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	21UMA303C.1	2	3										1	1	2	1
2	21UMA303C.2	3	1	2	1								1	2	3	1
3	21UMA303C.3	3	3	1	1	1			1				1	1	2	1
4	21UMA303C.4	3	3	2	2	1			1				1		1	1

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

(For students admitted to I year in 2021-22)

21UEE305C	Network Analysis	03 - Credits (2 : 2 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 52		SEE Marks : 50

UNIT – I	(7L-8T 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	(6L-6T Hours)

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Compensation theorem, Tellegan's theorem - Numerical Problems

UNIT – III	(7L-6T Hours)

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

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

UNIT – IV	(6L-6T Hours)

Resonant Circuits: Series and parallel resonance, frequency-response of series and parallel circuits, Q-factor, Bandwidth-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, 2014.
2. M. E. Van Valkenburg, "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.
5. Abhijit Chakrabarti, "Circuit Theory-Analysis and Synthesis", 7th Edition, Dhanpat Rai Technical Publishers, 2016.

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(For students admitted to I year in 2021-22)

Course Outcomes:

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

1. Calculate current, voltage and power dissipated in various branches of the complex electric circuit having three or more meshes/nodes by applying electric circuit theorems
2. Solve and analyze the electrical circuits under transient conditions with the given initial conditions using Laplace transforms
3. Analyze series and parallel resonance circuits to determine the circuit parameters (L&C) for which the circuit will resonate at given frequency
4. Evaluate Admittance, Impedance, Hybrid and Transmission parameters for a given two port network by deriving the relation between different set of parameters.

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	21UEE305C.1	3							1		1		1	3	1	1
2	21UEE305C.2	3	1						1		1		1	2	3	1
3	21UEE305C.3	3	3	2	2	1			1		1		1	1	1	1
4	21UEE305C.4	3	3	3	3	1			1	1	1		2	1	1	1

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

(For students admitted to I year in 2021-22)

21UEE306C	Electronic Circuits	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.
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	**10 Hrs.**
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:** Transfer characteristics of JFET, Important relationships, Depletion & Enhancement type MOSFETs.	
UNIT – III	**10 Hrs.**
Basics of 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. **Signal Processing circuits:** Precision half wave & full wave rectifiers, limiting circuits, clamping circuits, peak detectors, sample and hold circuits, Voltage regulators basics, voltage follower regulator, adjustable output regulator.	
UNIT – IV	**10 Hrs.**
Applications of Op-Amps: Zero crossing detectors, inverting Schmitt trigger circuit, non-inverting Schmitt circuit. Astable multivibrator and mono-stable multivibrator using 555 timer, Phase shift oscillator, oscillator amplitude stabilization and Wein bridge oscillator. **Active filters:** First and second order high pass and low pass filters, band stop and band pass filters.	
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, 9thedition, Pearson/Prentice Hall, India, 2006. 5. Ramakanth A. Gayakwad, "Operational Amplifier and Linear ICS", 4thedition, PHI, 2016. 6. Jacob Millman, Arvin Grabel, Microelectronics, 2ndedition, Tata McGraw Hill, New Delhi, 2003	
Course Outcomes: After completion of the course the students will be able to, 1. Design and analyze diode clipping, limiting and clamping circuits	

2. Examine various transistor biasing circuits
3. Analyse BJT, MOSFETs, and multistage amplifiers
4. Design and analyse op-amp based feedback circuits and various applications of op amps

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	21UEE306C.1	3	2	2									2	3	3	3
2	21UEE306C.2	3	2										2	2	3	3
3	21UEE306C.3	3		3		1			1		1		1	2	2	1
4	21UEE306C.4	3	3	3		1			1		1		2	2	2	1

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

(For students admitted to I year in 2021-22)

21UEE307C	Electrical Machines-I	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.

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.

UNIT – II	10 Hrs.

Three Phase Transformers

Construction of three phase transformer and types, bank of single phase transformers for three phase operations and their connections: star-star, star-delta, delta-star, delta-delta, open delta, Labeling of terminals and vector groups, Single unit three phase transformer, Choice of connections:, Harmonics in transformer, Suppression of harmonics by tertiary winding, Scott connection and Phase conversion.

(Note: No analysis of Scott connection)

Parallel operation of Transformer

Need for parallel operation, conditions to be satisfied for parallel operation and load sharing.

Auto Transformer: Construction, working principle, saving of copper and applications.

UNIT – III	10 Hrs.

Three Phase Induction Motor:

Construction and types of motors, Principle of operation, production of rotating magnetic field, slip, rotor induced emf and its 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, Cogging and crawling, Introduction of circle diagram.

(Note: Drawing of circle diagram would be done from NL and BR test in the laboratory. No problems on circle diagram in theory papers)

UNIT – IV	10 Hrs.

Starting and Speed Control of Three Phase Induction Motors:

Need for starter, DOL, star delta, autotransformer and rotor resistance starters, Calculation of starting torque, double cage and deep bar motors, speed control by rotor resistance, voltage control, V/f control, NEMA classifications.

Introduction of Induction generator, Linear induction motor

Single Phase Induction Motors: Construction, double field revolving theory, equivalent circuit, starting of single phase motors: Resistance split phase, capacitor start and capacitor run motors, shaded pole motors.

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Reference Books:

1. I J Nagarath and DP Kothari, "Electrical machines", 4th - Edition, TMH, New Delhi, 2020
2. Ashfaq Hussain, "Electrical Machines", Dhanpat Rai & Co. Publications, 3rd Edition, 2017
3. P.S. Bhimra, "Electrical Machinery", Khanna publishers, 7th Edition 2018
4. P.S. Bhimra, "Generalized Theory of Electrical Machines", Khanna publishers, 2014
5. M. G. Say, "Alternating Current Machines", ELBS publishers, 1986
6. Alexander Langsdorf, "Theory of alternating current machines", TMH, 1999

Course Outcomes:

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

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 starting current and speed of 3-phase induction motors by suitable methods.
4. Select suitable induction motors for different industrial or domestic 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	21UEE307C.1	3	2	2									2	3		3
2	21UEE307C.2	3	2										2	3		3
3	21UEE307C.3	3		3		1			1		1		1	3		2
4	21UEE307C.4	3	3	3		1			1		1		2	3	1	3

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

(For students admitted to I year in 2021-22)

21UEE308C	Electrical & Electronic Measurements	03 - Credits (2 : 0 : 2)
Hours/Week : 2L + 2P		CIE Marks : 50
Total Hours :		SEE Marks : 50

UNIT – I	7 Hrs.
Measurement of Resistance Inductance and Capacitance: Measurement of medium resistance: Wheatstone bridge, Limitations; Measurement of 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 Capacitance Bridge, Measurement of Capacitance: Types of bridges for measurement of capacitance, De Sauty's bridge. Sources of errors in bridge circuits. Sources and Detectors	
UNIT – II	**6 Hrs.**
Measurement of Power and Related Parameters: Dynamometer Type Wattmeter; Induction Type Single Phase Energy meter – Construction, Theory; Dynamometer Type Single Phase Power Factor meter – Construction and Operation; Weston Frequency meter.	
UNIT – III	**7Hrs.**
Extension of Instrument ranges: Introduction; Shunts and Multipliers; Instrument Transformers: Advantages of Instrument Transformers, Ratios of Instrument Transformers, ratio Correction Factor, Burden on Instrument Transformer; Current Transformer(CT) – Theory of CT; Potential Transformer(PT) – Differences between CT and PT, Theory of PT.	
UNIT – IV	**6 Hrs.**
Sensors and transducers: 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. Advantages and Disadvantages of Electrical transducers. Principle, construction, working and application of: Resistive transducers - Resistance Temperature Detector (RTD), Light Dependent Resistor (LDR); Capacitive transducers; Inductive transducers: Linear variable differential transformer (LVDT). LM 35 sensor.	

List of Experiments

1. Measurement of low resistance using Kelvin's double bridge.
2. Measurements of inductance using Maxwell's L-C bridge.
3. Measurements of capacitance using De-sauty's bridge
4. Adjustment and calibration of l-Φ Energy meter.
5. Measurement of power in a balanced 3-phase circuit using two wattmeters for star and delta connected loads.
6. Evaluation of transfer characteristics of Resistance Temperature Detector (RTD) using RTD
   Module.
7. Evaluation of transfer characteristics of Light Dependent Resistor (LDR) using LDR module.
8. Evaluation of transfer characteristics of Semiconductor Temperature Sensor using LM35 sensor module/unit.

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Reference Books:

1. A. K. Sawhney, "Electrical & Electronic Measurements and Instrumentation", 19th edition, Dhanpat Rai & Son's, New Delhi, 2011.
2. Golding & Widdies, Pitman, "Electrical Measurements and Measuring Instruments", 5th edition, D.R & Son's, New Delhi.
3. Ramon P. Areny, John G. Webster, "Sensors and Signal Conditioning", 2nd Edition, Wiley India Private Ltd.
4. Ian R. Sinclair, "Sensors and Transducers", 3rd Edition, Newgen Publication.

Course Outcomes:

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

1. Measure resistance, inductance and capacitance of a given specimen using DC and AC Bridges and validate the results analytically
2. Measure electrical power and related parameters using different types of measuring devices and validate the results analytically
3. Select Shunts & Multipliers, CT's & PT's to extend the range of ammeters & voltmeters
4. Select sensors & transducers for different electrical based 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	21UEE308C.1	3	2	2									2	3		3
2	21UEE308C.2	3	2										2	3		3
3	21UEE308C.3	3		3		1			1		1		1	3		2
4	21UEE308C.4	3	3	3		1			1		1		2	3	1	3

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

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21UEE310L	Electronic Circuits 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. Study of Op-Amp as
   - Inverting and non-inverting amplifier
   - Voltage follower
   - Adder and substractor
6. Study of Op-Amp as zero crossing detector
7. Study of Op-Amp as Schmitt trigger
8. Design and testing of Op-Amp based RC phase shift oscillator.
9. Study of rectifiers using Op-Amp.
10. Design and testing of first and second order filters using Op-Amp.
11. Study of astable multi vibrator using 555 timer

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. Draw the circuit, write the procedure and select the required electronic components for a given experiment.
2. Rig up the circuit and conduct experiments using the electronic components to achieve desired results.
3. Analyze the results to write the inference and prepare a detailed report.

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	21UEE310L.1	3				1	1					1	1	2	3	3
2	21UEE310L.2	3	1		1	2						1	2	3	3	3
3	21UEE310L.3	3	2	2	1	2	2					1	2	2	3	2

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

(For students admitted to I year in 2021-22)

21UEE311L	Electrical Machines Laboratory - I	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. Polarity test
3. Sumpner's test to calculate no load loss and full load loss and predetermine efficiency.
4. Parallel operation of two single phase transformers and determine their load sharing
5. Connection of three single phase transformers: star-star, star-delta, delta-delta and delta-star.
6. Brake 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 equivalent circuit diagram and performance evaluation.
8. No-load and blocked rotor test on three phase induction motor to draw the circle diagram and hence the performance evaluation of given motor.
9. Speed control of three phase slip ring induction motor by rotor resistance.
10. Brake load test on single phase induction motor and performance evaluation (torque-speed, BHP- efficiency, slip -BHP, etc.)

Reference Books:

1. I J Nagarath and DP Kothari, "Electrical machines", 4th Edition, TMH, New Delhi
2. Ashfaq Hussain, "Electrical Machines", Dhanpat Rai & Co. Publications, 3rd Edition, 2017
3. P.S. Bhimra, "Electrical machinery", Khanna publishers, 7th Edition 2018
4. Mohinder Singh Sejwal "Laboratory manual for Electro mechanics", Curriculum Development Cell, Dept. of EE IIT Delhi, Wiley Eastern Ltd, ISBN 0852261438

Course Outcomes:

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

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.

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	21UEE311L.1	3	1	1		1	1					1	1	2	3	3
2	21UEE311L.2	3	1	1	1							1	1	3	3	3
3	21UEE311L.3	3	1	1	1							1	1	2	3	2

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

(For students admitted to I year in 2021-22)

21UEE315C	Agri Tech	01 - Credits (1 : 0 : 0)
Hours/Week : 01		CIE Marks : 50
Total Hours : 15		SEE Marks : 50

UNIT – I	(4 Hours)
Irrigation: Need for Irrigation, History of Irrigation in India, Ill effects of irrigation, Type of Irrigation methods (Surface, Drip, Sprinkler) pros and cons of each method, Types of pumps employed in agriculture-pros and cons.	
UNIT – II	**(4 Hours)**
Crop water assessment: Concept of Evapotranspiration, Growth stages of crops, Different methods for assessment of evapotranspiration, Crop factors. Assessment of hydraulic head and HP rating of Pumps, Assessment of energy conservation and saving potential.	
UNIT – III	**(4 Hours)**
Different types of SPV irrigation systems and components, Advantages of SPV pumps, Issues in sizing the SPV based pumps, Govt. schemes for SPV irrigation systems.	
UNIT – IV	**(3 Hours)**
Design of Drip Irrigation Systems: Components used, Layout of drip irrigation, Selection of lateral pipelines, Sizing of pumping unit, Cost and Energy Analysis.	

Reference Books:

1. A.M.Michael, “Irrigation Theory and Practice”, Vikas Publishers, Second Enlarged Edition, 2011.
2. B.F.Ronad, S H Jangamshetti, “Optimum Sizing of SPV Irrigation Systems based on Field Conditions”, LAP LAMBERT Academic Publishing, August 2018.
3. M.Kay, N.Hatcho, “Small-Scale Pumped Irrigation: Energy and Cost”, Irrigation Water Management Training Manual, Food and Agriculture Organization of United States, Rome, 1992.

Course Outcomes:

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

1. Identify the challenges faced by farmers and will be able to suggest probable solution
2. Calculate the exact water requirement of the crops for the specific location for the local climatic conditions and suggest the suitable size of the irrigation pumps
3. Analyze the working of various irrigation schemes powered by AC Grid/SPV powered systems
4. Suggest the type of micro irrigation scheme for specified agriculture land for proposed crops

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	21UEE315C.1	2	2										1	2		2
2	21UEE315C.2	2	1	1			1						1	1		2
3	21UEE315C.3	2	1	1			1	1	1				1	1		2
4	21UEE315C.4	2	2	1	1		1	1	1				1	1		1

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

(For students admitted to I year in 2021-22)

21UHS321C	Constitution of India	01 - Credits (1 : 0 : 0)
Hours/Week : 01		CIE Marks :
Total Hours :15		SEE Marks :

UNIT – I	(4 Hours)
Introduction Indian constitution: The Salient Features of the Indian Constitution. Preamble to the Constitution of India. Fundamental Rights, Directive Principles of State policy and Fundamental Duties**.**	
UNIT – II	**(4 Hours)**
The Union and State Governments: The Union Executive, The Union Legislature and The Union Judiciary - The Supreme Court of India	
UNIT – III	**(4 Hours)**
The Indian State Government: The State Executive, The State legislature and The State Judiciary **The Local Government:** Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.	
UNIT – IV	**(3 Hours)**
Election provisions, Emergency provisions, Amendment of the constitution:	

Reference Books:

1. An introduction to the constitution of India and Profession Ethics, Venkatesh B. R. and Merunandan K. B., Idea International Publication, Bangalore.
2. M. V. Pylee, “Introduction to the Constitution of India”, 4th Edition, Vikas publication, 2005.
3. The Constitution of India and Profession of Ethics, K. R. Phaneesh, Sudha Publication, Bangalore.
4. Durga Das Basu (D. D. Basu), “Introduction to the constitution of India”, (Student Edition), 19th edition, Prentice-Hall EEE, 2008.
5. Engineering Ethics: Charles Harries J. R. and Michard and Michael J. Rabins

Course Outcomes:

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

1. Understand and explain the significance of Indian Constitution as the fundamental law of the land.
2. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
3. Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail.
4. Elaborate Electoral Process, Emergency provisions and Amendment procedure.

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	**21UHS321C.1**						**1**	**1**					**1**			
2	**21UHS321C.2**						**3**	**1**					**2**			
3	**21UHS321C.3**						**1**	**1**					**1**			
4	**21UHS321C.4**												**1**			

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

(For students admitted to I year in 2021-22)

21UHS324C	Universal Human Values-II	01 - Credits (1 : 0 : 0)
Hours/Week : 01		CIE Marks :
Total Hours :15		SEE Marks :

UNIT – I	(4 Hours)
Introduction to Value Education: Right Understanding; Relationship and Physical Facility; Understanding Value Education; Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity -the Basic Human Aspiration-Current Scenario and Method to Fulfill the Basic Human Aspirations.	
UNIT – II	**(4 Hours)**
Harmony in the Human Being: Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.	
UNIT – III	**(4 Hours)**
Harmony in the Family and Society and Nature: Harmony in the Family – the Basic Unit of Human Interaction; 'Trust' – the Foundational Value in Relationship; 'Respect' – as the Right Evaluation: Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society; Vision for the Universal Human Order; Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature..	
UNIT – IV	**(3 Hours)**
Implications of the Holistic Understanding – a Look at Professional Ethics Definitiveness of (Ethical) Human Conduct; A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order; Competence in Professional Ethics; Holistic Technologies, Production Systems and Management Models; Strategies for Transition towards Value-based Life and Profession	

Reference Books:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034- 53-2
3. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
4. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Explore holistic vision of life - themselves and their surroundings.
2. Develop competence and capabilities for maintaining Health and Hygiene.
3. Analyze various problems in life, family, Society and in handling problems with Sustainable Solutions.
4. Apply values to their own self in different day-to-day settings in real life and in handling problems with sustainable solutions.
5. Adopt the value of appreciation and aspiration for excellence and gratitude for all.

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

(For students admitted to I year in 2021-22)

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	**21UHS324C.1**							**3**	**2**	**3**			**1**			
2	**21UHS324C.2**						**3**	**3**	**1**	**1**			**1**			
3	**21UHS324C.3**						**3**	**3**	**2**	**1**			**1**			
4	**21UHS324C.4**						**2**	**2**	**3**	**2**			**1**			
5	**21UHS324C.5**								**3**				**1**			

Syllabus for

B.E. IV - Semester

for academic year 2022 – 2023

(For students admitted to I year in 2021-22)

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

(For students admitted to I year in 2021-22)

21UMA403C	Computation Techniques for Electrical Systems -II	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.
Fourier analysis of Discrete Time Periodic and Aperiodic signals: Introduction, Properties of Discrete - time Fourier series , Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on Fourier series and Fourier transforms.	
UNIT – II	**10 Hrs.**
Numerical Analysis – I: Introduction to root finding problems, 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 Method (without proof). Numerical differentiation using Newton's forward and backward formulae-problems. Numerical Integration: Trapezoidal rule, Simpson's one third rule.	
UNIT – III	**10 Hrs.**
Numerical Analysis - II: Numerical methods for solution of differential equations: Euler's and Modified Euler's method, Runge-Kutta 4th order method. Step by step method(point by point method)**Statistics:** Curve fitting by the method of least squares: $y = a + bx$, $y = a + bx + cx^2$, $y = ab^x$.	
UNIT – IV	**10 Hrs.**
Basic Probability Theory: Probability concepts, Random variables probability distributions. Binomial distributions, Poisson distributions and Normal distributions. Concept of joint probability, Joint probability distributions.	

References:

1. Numerical Methods for Engineers by Steven C Chapra & Raymond P Canale.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers, New Delhi.
3. Advanced Engineering Mathematics By H. K. Das, S. Chand & company Ltd. Ram Nagar, New Delhi
4. "Signals and Systems", Ganesh Rao, Satish Tunga, Sanguine Technical Publishers, 2nd Edition, 2020.
5. Signals and Systems, Uday Kumar S.PRISM book publisher, 6th Edition, 2013
6. H P HSU, "Signals and Systems," Schaums Outline, TMH, 2nd Edition, 2011.
7. Probability and stochastic processes by Roy D. Yates and David J. Goodman, wiley India pvt. ltd 2nd edition 2012.
8. Theory and problems of probability by Seymour Lipschutz (Schaum's Series).

Course Outcomes:

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

1. Apply the concepts of Fourier series and Fourier transforms to analyse Discrete Time Periodic and aperiodic signals.
2. Solve engineering problems using numerical techniques.
3. Obtain the numerical solution of ordinary differential equations.
4. Apply the concepts of Statistics and probability to solve problems in Engineering.

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

(For students admitted to I year in 2021-22)

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	21UMA403C.1	2	3										1	1	2	1
2	21UMA403C.2	3	1	2	1								1	2	3	1
3	21UMA403C.3	3	3	1	1								1	1	2	1
4	21UMA403C.4	3	3	2	2	1	1						1		1	1

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

(For students admitted to I year in 2021-22)

21UEE405C	Power System I	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.

AC Transmission Systems: Typical AC transmission system, Advantages of high voltage transmission. Comparison of conductor material in overhead lines: 3 phase 3 wire system, 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 – II	10 Hrs.

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 – III	10 Hrs.

Distribution Systems: Classification of distribution systems. Overhead Vs Underground distribution system. Connection schemes of distribution system. Requirements of a distribution system. Types of DC distributors, DC distributor fed at one end- Concentrated loading, Uniform loading. DC distributor fed at both ends - Concentrated loading.AC distribution calculation, Methods of solving AC distribution issues.

Protective Relaying and Protective Schemes: 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. Merz-Price protection for generator, Merz -Price protection of Transformer.

UNIT – IV	10 Hrs.

Static Relays: 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 : Principles of AC circuit breaking, Principles of DC circuit breaking Types of circuit breakers- Air break and air blast circuit breakers, SF6 circuit breakers- Puffer type and Non Puffer type.

Reference Books:

1. Mehta V K and Rohit Mehta, " Principals of Power Systems", 4th edition, S Chand and Company Ltd, Publishers, New Delhi, 2015.
2. Soni, Gupta and Bhatnagar, "Power System Engineering", 5th edition, DhanapatRai and Co.(P) Ltd. Publishers, New Delhi, 2016.

3. Sunil Rao, "Switchgear and Protection and Power Systems", 13th edition, Khanna Publishers, 2008.
4. J.B.Gupta, "Switchgear and Protection", (2nd edition), Katson Publisher, 2013.
5. 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 various mechanical components for overhead transmission line based on the required electrical properties, mechanical properties and available budget
2. Estimate sag for equal, unequal supports with and without considering wind/ice loading
3. Assess performance of short, medium and long transmission lines in terms of efficiency and regulation
4. Select relevant method to implement protective schemes against different faults in electrical 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	21UEE405C.1	3											1	1	2	3
2	21UEE405C.2	3	1										1	1	1	2
3	21UEE405C.3	3	3	2	2	1	1						1	2	2	2
4	21UEE405C.4	3	3	3	3	1	1		1		1		2	1	1	1

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

(For students admitted to I year in 2021-22)

21UEE406C	Logic Design	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.
Introduction: Introduction to Digital logic Design; Binary Systems and Codes: Binary Numbers, Octal and Hexadecimal Numbers; Number Base Conversions; Arithmetic Operation with different Bases; Complements. Signed Binary Numbers; Binary Codes and conversions: BCD, Gray, ASCII and EBCDIC. Binary Logic and Logic Gates: AND, OR and NOT.	
UNIT – II	**10 Hrs.**
Boolean Algebra and Logic Gates: Basic Definition. Basic Theorems. Boolean Functions; Standard Forms: Minterm and Maxterm. Simplification of Boolean Functions using SOP and POS; Logic Operations: NAND, NOR, Exclusive-OR and Equivalence. Integrated Circuits **Gate-Level Minimization:** The Map Method. Two- and Three-Variable Map. Four-Variable Map. Product of Sums Simplification. Don't-Care Conditions, logic gates implementation, determination and selection of Prime Implicants, Essential and Nonessential prime Implicants.	
UNIT – III	**10 Hrs.**
Analysis and Synthesis of Combinational Circuits: Combinational Circuits. Analysis and Design Procedure; Binary Adders-Subtractor; Decoders and Multiplexers, Sequential Circuits, Latches. **Flip-Flops:** RS, D, JK and T; Analysis of Clocked Sequential Circuits. Design Procedure, Registers and Counters: Registers. Shift Registers; Synchronous Counters. Ripple Counters.	
UNIT – IV	**10 Hrs.**
Sequential Circuits with Programmable Logic Devices: Introduction, Random-Access Memory, Memory Decoding, Read-Only Memory. Programmable Logic Array. **Verilog:** Introduction to Verilog, Verilog Structural and Behavioral Design, Verilog Time Dimension and Test Benches.	

Reference Books:

1. Morris Mano, Charles R. Kime, Logic and computer design fundamentals, Pearson Prentice Hall, 2004
2. Basavaraj,B., Digital fundamentals, New Delhi : Vikas Publishing House, 1999.
3. Kandel Langholz, Digital Logic Design, Prentice Hall, 1988.
4. Rafiq uzzaman& Chandra, Modern Computer Architecture, West Pub. Comp., 1988.
5. Zvi. Kohavi, Switching and Finite Automata Theory, Tata McGraw Hill, India, 2004.
6. C. V. S. Rao, Switching and Logic Design, 3rd Edition, Pearson Education, India, 2009.
7. Donald D. Givone, Digital Principles and Design, Tata McGraw Hill, India, 2002.

Course Outcomes:

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

1. Simplify Boolean functions using various reduction algorithms
2. Design and implement variety of logical circuits using combinational logic
3. Design and implement variety of logical circuits using sequential logic
4. Model various Verilog descriptions to test and verify digital systems

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

(For students admitted to I year in 2021-22)

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	21UEE406C.1	3	2	2									2	1	3	1
2	21UEE406C.2	3	2	3									3	1	3	1
3	21UEE406C.3	3		3	1	1					1		3	1	3	1
4	21UEE406C.4	3	3	3	1	1			1		1		2	1	3	1

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

(For students admitted to I year in 2021-22)

21UEE407C	Electrical Machines-II	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	10 Hrs.
DC Generator: Construction of DC machines, introduction of armature windings, emf equation, types of excitations, no load and load characteristics (only separately excited and shunt field generator, no compound generator) Armature reaction and its effects, demagnetizing and cross magnetizing AT/pole, compensating winding, interpole, commutation **DC Motors:** Principle of Operation & concept of back EMF, torque equation, characteristics of D.C. motors (without compound motors), and applications, universal motor.	
UNIT – II	**10 Hrs.**
Starting, Speed control and Braking of DC Motors: Necessity of starters, resistance starters (excluding three point and four point starter), Speed control of shunt field, separately excited and series motors, Ward Leonard method of speed control, Braking of DC motors **Testing of D.C Motors:** Losses in DC Machine, Efficiency, direct load test, Swinburne's test, Field's test on DC series motors.	
UNIT – III	**10 Hrs.**
Synchronous Machines: Construction and types, types of field excitation, emf equation for generator, effect of distribution winding and chorded coils, effects of harmonics on emf generated, phasor diagram of a Synchronous generator with cylindrical rotor, voltage regulation, calculation of synchronous reactance by emf method **Salient pole synchronous machines:** Two-reaction model, slip test.	
UNIT – IV	**10 Hrs.**
Parallel operations of alternators: Synchronization, parallel operation, operation on infinite bus, operating characteristics, power flow equations of Alternators **Synchronous Motors:** Principle of operation, methods of starting, phasor diagram, effect of changing excitation, V and inverted V curves of synchronous machines, hunting in synchronous machines, effect of damper windings	

Reference Books:

1. I J Nagarath and DP Kothari, "Electrical machines", 4th - Edition, TMH, New Delhi,2020
2. Ashfaq Hussain, "Electrical Machines", Dhanpat Rai & Co. Publications, 3rd Edition, 2017
3. P.S. Bhimra, "Electrical machinery", Khanna publishers, 7th Edition 2018
4. P.S. Bhimra, "Generalized theory of Electrical machines", Khanna publishers, 2014
5. M. G. Say, "Alternating Current Machines" ELBS publishers, 1986
6. Alexander Langsdorf, "Theory of alternating current machines", TMH, 1999

Course Outcomes:

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

1. Test the dc/ac generator and motor for losses and efficiency using various methods.
2. Analyse the effect of harmonics on ac generator and motor in emf generation.
3. Estimate the emf, number of poles/slots, losses, efficiency and power flow equations of dc/ac generator and motor
4. Select the suitable generator and motor for various engineering applications.

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

(For students admitted to I year in 2021-22)

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	21UEE407C.1	3				1	1						1	1	3	2
2	21UEE407C.2	3	1										1	1	2	1
3	21UEE407C.3	3	3	2	2								1		2	1
4	21UEE407C.4	3	3	3	3	1		1					2	1	2	1

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

(For students admitted to I year in 2021-22)

21UEE408C	Control Systems	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	(10 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. Usage of MATLAB command-line functions to verify the solution.	
UNIT – II	**(10 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. Usage of MATLAB command-line functions to verify the solution.	
UNIT – III	**(10 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 Techniques:** Root locus concepts, Construction of root loci. Usage of MATLAB command-line functions to verify the solution.	
UNIT – IV	**(10 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. **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. Usage of MATLAB command-line functions to verify the solution.	

Reference Books:

1. Norman S Nise “Control System Engineering”, McGraw Hill, 2010.
2. Benjamin C Kuo, “Automatic Control System”, VII- Edition, PHI, 2010.
3. Richard C. Dorf Robert H Bishop “Modern Control Systems”, VII- Edition, Addison Wesle
4. Ogata, K., 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 function step.
4. Formulate different types of analysis in frequency domain to obtain the stability of the LTI control systems.

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

(For students admitted to I year in 2021-22)

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	21UEE408C.1	3	3	2	2	1							1	1	2	
2	21UEE408C.2	3	3	3	2	2							1	1	3	2
3	21UEE408C.3	3	3	2	2	2			1		1		1	1	3	2
4	21UEE408C.4	3	3	2	2	2			1		1		1	1	3	1

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

(For students admitted to I year in 2021-22)

21UEE410L	Power System – I 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. Operating characteristics of static Under/Over Voltage relay.
3. Operating characteristics of Microcontroller over voltage relay (DMT and IDMT)
4. Operating characteristics of Electro-Mechanical over current relay.
5. Operating characteristics of Electro-Mechanical Earth fault relay.
6. Operating characteristics of Microcontroller over current 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)

Reference Books:

1. Mehta V K and Rohit Mehta, " Principals of Power Systems", 4th edition, S Chand and Company Ltd, Publishers, New Delhi, 2015.
2. Soni, Gupta and Bhatnagar, "Power System Engineering", 5th edition, DhanapatRai and Co.(P) Ltd. Publishers, New Delhi, 2016.
3. Sunil Rao, "Switchgear and Protection and Power Systems", 13th edition, Khanna Publishers, 2008.
4. J.B.Gupta, "Switchgear and Protection", (2nd edition), Katson Publisher, 2013.
5. 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. Determine the electrical network parameters using electrical topology
2. Perform test to evaluate the breakdown strength of transformer oil.
3. Measure high AC and DC voltage using Sphere-gap test

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	21UEE410L.1	2	3										1	1	2	1
2	21UEE410L.2	3	1	2	1								1	2	3	1
3	21UEE410L.3	3	3	1	1	1			1				1	1	2	1

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

(For students admitted to I year in 2021-22)

21UEE411L	Logic Design Laboratory	01 - Credits (0 : 0 : 1)
Hours/Week : 02		CIE Marks : 50
Total Hours : 26		SEE Marks : 50

List of Experiments

1. Study and verify the truth table of logic gates
2. Simplify the given expression and to realize it using Basic gates and Universal gates Design and testing of diode clipping and clamping circuits.
3. Realization of
   i. Half Adder and Full Adder
   ii. Half Subtractor and Full Subtractor by using Basic gates and NAND gates
4. Design and set up the following circuit using IC 7483.
   i. A 4-bit binary parallel adder.
   ii. A 4-bit binary parallel subtractor
5. Design and realize the following using IC 7483.
   i. BCD to Excess- 3 Code
   ii. Excess-3 to BCD Code.
6. Realization of Binary to Gray code converter and vice versa
7. Design and set up the MUX & DEMUX circuits for following cases
   i. 4:1 Multiplexer (MUX) using only NAND gates.
   ii. 1:4 Demultiplexer(DE-MUX) using only NAND gates.
   iii. Verify the various functions of IC 74153(MUX) and IC 74139(DEMUX).
   iv. Half/Full Adder and Half/Full Subtractor using IC 74153.
8. Realization of One & Two Bit Comparator and study of 7485 magnitude comparator
9. Realization of decoder circuits using basic gates and to verify with IC 74LS139
10. Set up and test a 7-segment static display system to display numbers
11. Design Encoder circuits for following cases
    i. Decimal-to-BCD Encoder using IC 74147.
    ii. Hexadecimal-to-Binary Encoder using IC
    iii. 74148 Encoders and IC 74157 Multiplexer
12. Truth Table verification of following Flip-Flops
    i. RS Flip Flop
    ii. T type Flip Flop.
    iii. D type Flip Flop.
    iv. JK Flip Flop.
    v. JK Master Slave Flip Flop.
13. Realization and study of following types of Shift Registers.
    i. SISO (Serial in Serial out)
    ii. SIPO (Serial in Parallel out)
    iii. PIPO (Parallel in Parallel out)
    iv. PISO (Parallel in Serial out)
14. Design and set up of Sequence Generator using IC 7495
15. Realization and study of Ring and Johnson counters
16. Design and test 3-bit binary synchronous & asynchronous counters using flip-flop IC 7476 for the given sequence.

17. Design IC 74193 as a up/down counter
18. Design IC 7490 as a decade counter with BCD count sequence

Reference Books:

1. Morris Mano, Charles R. Kime, Logic and computer design fundamentals, Pearson Prentice Hall, 2004
2. Basavaraj,B., Digital fundamentals, New Delhi: Vikas Publishing House, 1999.
3. KandelLangholz, Digital Logic Design, Prentice Hall, 1988.
4. Rafiquzzaman& Chandra, Modern Computer Architecture, West Pub. Comp., 1988.
5. Zvi. Kohavi, Switching and Finite Automata Theory, Tata McGraw Hill, India, 2004.

Course Outcomes:

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

1. Draw the circuit, write the procedure and select the required components for a given experiment
2. Rig up the circuit, simplify the expressions using K-map and conduct experiments using the selected components to achieve desired results
3. Verify the results to write the inference and prepare a detailed report.

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	21UEE411L.1	2	3										1	1	2	1
2	21UEE411L.2	3	1	2	1								1	1	3	1
3	21UEE411L.3	3	3	1	1	1			1				1	1	2	1

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

(For students admitted to I year in 2021-22)

21UEE412L	Electrical Machines Laboratory-II	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 and determine critical resistance and critical speed.
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 to determine losses of a dc shunt motor and efficiency.
6. Ward Leonard method of speed control of D.C. motor.
7. Fields test on dc series motors to determine losses and efficiency.
8. Voltage regulation of alternator by EMF and MMF method.
9. Synchronization of Alternator with infinite bus.
10. V and Inverted V curves of a synchronous motor

Reference Books:

1. I J Nagarath and DP Kothari, "Electrical machines", 4th - Edition, TMH, New Delhi
2. Ashfaq Hussain, "Electrical Machines", Dhanpat Rai & Co. Publications, 3rd Edition, 2017
3. P.S. Bhimra, "Electrical machinery", Khanna publishers, 7th Edition 2018
4. P.S. Bhimra, "Generalized theory of Electrical machines", Khanna publishers, 2014
5. M. G. Say, Performance and design of AC machines, CBS publishers.
6. Alexander Langsdorf, "Theory of alternating current machines", TMH, 1999

Course Outcomes:

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

1. Test the parameters of synchronous machine and DC machines by various methods and predetermine their performance such as losses, efficiency and regulation
2. Analyse the performance of DC and synchronous machines and tabulate the readings by their characteristics.
3. Select the suitable ac/dc generator and motor for various engineering 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	21UEE412L.1	3	1	1		1	1					1	1	2	3	3
2	21UEE412L.2	3	1	1	1							1	1	3	3	3
3	21UEE412L.3	3	1	1	1							1	1	2	3	2

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

(For students admitted to I year in 2021-22)

21UEE415I	Summer Internship – I	02 - Credits (0 : 0 : 2)
Hours/Week :		CIE Marks : 50
Total Hours :		SEE Marks : 50

List of Activities

1. Monitor and Study Solar Radiation and SPV Panels
2. Monitor and Study wind measurement – using anemometer
3. Monitor and study DC irrigation pump powered by solar photovoltaic
4. Monitor and Study Solar thermal devices –
   a. Solar still
   b. Solar drier
   c. Solar boxcooker
   d. Solar concentrating dish cooker
   e. Solar water heaters
5. Monitoring and study of energy conservation in lighting systems
6. Energy Conservation study in domestic and institutional campus
7. Visit to 255 kW solar roof top power plant

Course Outcomes:

After undergoing the internship, students will be able to

1. Demonstrate the technical skills acquired during the internship
2. Operate the systems/ devices independently and tabulate the experimental results
3. Build the professional technical document with relevant conclusions drawn
4. Develop communication, interpersonal and other critical skills in the real time work environment

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	21UEE415I.1	1	1			2						2		2	1	2
2	21UEE415I.2	1	1			2	1		1		2	2		3	1	2
3	21UEE415I.3	1				1	1					2		2		1
4	21UEE415I.4	1							1	3	3	2		2		1