EE201N: ELECTROMAGNETIC FIELDS

Teaching Scheme : 03 L + 00 T; **Total:** 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course provides knowledge about power electrostatic and magneto static filed and to familiarize students with vector calculus, static and magnetic field

DESIRABLE AWARENESS / SKILLS

Basic knowledge of engineering mathematics, matrix calculation, Laws related to electrical field

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to

1. understand the concept of electrostatic field and current properties
2. analyze boundary conditions between dielectrics and to calculate capacitances of different types of capacitors
3. understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.
4. understand displacement current, time varying fields, and maxwell's equation
5. analyze propagation and reflection of EM waves and transmission lines.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION),,,

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3		2		3			1	1	2			1		
2	2	2	3		2	1		2		1	2		1		1
3								1	1	2		2			
4	2	2	2		3			1	2		2		1		
5						2			2	2		2			

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Static Electric Field: **[08 Hrs.]**

Coulombs law, Electric field intensity due to different charge distribution, electrical field due to point charges, line, surface and volume charge distributions, Electric flux density, Gauss' law, Divergence and Divergence theorem, Maxwell's first equation Potential and potential difference, Potential field of system of charges, Potential gradient, Dipole,

Conductors, Dielectrics and Capacitance: **[08 Hrs.]**

Current and current density, continuity of current, boundary conditions of perfect dielectric materials. permittivity of dielectric materials, capacitance, capacitance of a two wire line, poisson's equation and laplace's equation.

Static Magnetic Fields: **[08 Hrs.]**

Biot-Savart law, ampere law, Curl, Stroke's theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials. Force on a moving charge, force on a differential current element, force between differential current elements.

Time Varying Fields and Maxwell's Equations: **[08 Hrs.]**

Faraday's law for electromagnetic induction, displacement current, point form of Maxwell's equation, integral form of Maxwell's equations, motional electromotive forces.

Electromagnetic Waves: **[08 Hrs.]**

Derivation of wave equation, uniform plane waves, Maxwell's equation in phasor form, wave equation in phasor form, plane waves in free space and in a homogenous material. Poynting;s theorem

Text Books

1. Elements of Electromagnetic, M. N. O. Sadiku and and S.V. Kulkarni, 2nd edition Oxford University Publication, 2014
2. Electromagnetism-Problems with solution , A. Pramanik, Prentice Hall India, 2012
3. Engineering Electromagnetic,by W. Hayt, McGraw Hill Education, 2012

Reference Books

1. The Electromagnetic Field In Its Engineering Aspects,G. W. Carter, Longmans , 1954
2. Electricity and Magnetism, W. J. Duffi, McGraw Hill Publication, 1980
3. The Fundamentals of Electromagnetism, E. G. Cullwick, Cambridge University Press, 1966
4. Introductory Engineering Electromagnetic, B. D. Popovic, Addison-Wesley Educational Publishers, International edition, 1971
5. Elements of Electromagnetic Fields, S. P. Seth, Dhanpat Rai & Co, second edition

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE202N: ANALOG CIRCUITS

Teaching Scheme : 03 L + 00 T; **Total:** 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course provides knowledge about power semiconductor devices and to familiarize students with construction, their working, operation, performance and applications.

DESIRABLE AWARENESS / SKILLS

SH152N: Engineering Physics

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to

1. demonstrate the diode based circuits i.e. rectifiers, clippers, clampers, series and shunt regulators
2. explain and analize the circuits involving BJT, FET and MOSFET
3. demonstrate the op-amp construction, characteristics, parameter limitations, various configurations and basic applications of op-amp
4. describe basic op-amp circuits, particularly various linear and non-linear circuits.
5. discuss construction of active filters, timer and various types of signal generators

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	1	2	3			1	1	2					
2	1		1	2	3	1		1		1	2		1	1	
3	1	2		1	3			1	1	2		2	1		
4	1	1	3		3			1	1		2		1		1
5		2	2	1		2			2	2		2	1		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Diode Circuits: **[8Hrs.]**

Review of structure, working principle and V-I characteristics of diode, Half wave and Full wave rectifier, Clipping circuits, Clamping circuits, Zener diode, Regulators using zener diodes

Transistor Circuits: **[8Hrs.]**

Bi Junction Transistors (BJT) – Common Base (CB), Common Emitter (CE), Common Collector (CC) configuration, Input and output characteristics,DC biasing of CB, CC and CE, DC load lines, Stability factor, RC couple and transformer coupled BJT amplifier in CE configurations, Transistor power amplifiers.

FET and MOSFET: Physical structure, modes of operation, characteristics, types, DC analysis and applications

Op-amp Fundamentals: **[8Hrs.]**

Block diagram representation and its analysis, Ideal op-amp, Open loop op-amp configurations, Closed loop op-amp configurations- Inverting and Non-inverting op-amp, Basic applications of op-amp, op-amp parameters, compensated and uncompensated op-amps, Compensation techniques.

Linear and Non-linear Op-Amp Circuits: **[8Hrs.]**

I to V and V to I converters, Differential amplifiers, Instrumentation amplifiers, Transducer bridge amplifier and applications, Voltage comparators, Schmitt trigger, Precision rectifiers, Voltage limiters, Peak detectors, Sample and hold circuits, Integrator and differentiator, Log and antilog amplifiers.

Active Filters: **[8Hrs.]**

Classification, Transfer function, Butter worth filters, Low pass, High pass, Band pass, Band stop, Notch and all pass.

Timer: Functional block diagram of Timer 555, Applications of Timer

Signal Generators: Square wave generators, Triangular wave generators, Saw tooth wave generators

Text Books

1. Microelectronic Circuits, A.S. Sedra and K. C. Smith,4th edition, New York Oxford University Press, 1998.

2.Op-amps and Linear Integrated Circuits Technology, R. A. Gaikwad, PHI Publications.

3.Linear Integrated Circuits, D. Roy Chaudhari, New Age International Publishers.

4.Design with Operational Amplifiers and Analog ICs S. Franco, Tata McGraw-Hall.

Reference Books:

1. Operational Amplifiers ,G. B. Clayton, Butterworth & Co. Publications.

2.Integrated Circuits, K. R. Botkar, Khanna Publications.

3.Microelectronics , J. Millman and A.Grabel, 5th edition, McGraw Hill Education.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based onany two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE203N: NETWORK ANALYSIS

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course provides a brief introduction to students to analyze, design and synthesize network, network topologies, circuit theorems, initial conditions of network, Laplace transform of signals, two port network parameters and Fourier series of signals.

DESIRABLE AWARENESS / SKILLS

EE101N: BASIC ELECTRICAL ENGINEERING

COURSE OUTCOMES

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

1. apply various basic laws and theorem to electric circuit.
2. estimate two port network functions.
3. describe poles and zeros of network functions.
4. identify circuit matrices of linear graphs and analyze networks using graph theory.
5. solve differential equations with initial condition using Laplace Transform.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1			2			1	2	1		2			
2	3		1		2			2	1	1		2	1	1	
3	3	2			2			1	1	1		2	1		
4	3				2			1	2	1		2	2		1
5	3	1			2			1	2	1		2	1		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Network Theorems in AC Circuits **[8 Hrs.]**

Mesh Analysis, Source Conversions, Nodal Analysis, Independent and Dependent Sources, Thevenin's and Norton's Theorem, Superposition, Millman's, Reciprocity Theorem, Maximum Power Transfer Theorem, first order and second order differential equation for series and parallel RL, RC, RLC circuits.
Solution of Network Equation: Steady state and transient solution, forced and free response, Time constant for RL and RC circuits.

Two Port Network **[8 Hrs.]**

Network Elements, Classification of Network, Different Parameters of the Network, Combination of Resistances, Inductances and Capacitances. Port in Network, Network Configuration Z-Parameters, Y-Parameters, Hybrid Parameters, ABCD Parameters, Condition of Reciprocity and Symmetry in Two Port Network, Inter-Relationships between Parameters of Two Port Network.

Network Topology **[8 Hrs.]**

Concept of a Network Graph Terminology used in Network Graph Relation between Twigs and Links Properties of a Tree in a Graph Formation of Incidence Matrix. Properties of Incidence Matrix. Reduced Incidence Matrix, Number of Trees in a Graph, Principle of Duality, Construction of a Dual Network.

Network Functions **[8 Hrs.]**

Driving Point Impedance and Admittance, Transfer Impedance and Admittance, Voltage and Current Transfer Ratio, Concept of Poles and Zeros, Restriction on Location of Poles and Zeros in Driving Point Functions, Necessary Conditions for Transfer Functions, Natural Response of a Network.

Laplace Transformation for Electric Circuit **[8 Hrs.]**

Laplace Transformation Technique in Electric Circuit, Partial Fraction Expansion Method, Solution of differential equations and network equations using Laplace transform method, inverse Laplace transform analysis of electrical network with and without initial conditions,Laplace transform for step, impulse and ramp functions, The convolution integral Laplace transform of various periodic and non-periodic waveforms.

Text Books

1. Circuit Analysis,Ashutosh Chakraborty, 1st edition, Tata McGraw, 2011
2. Network Analysis, M. E. Van Valkenburg, 3rd edition, Prentice Hall, 2001
3. Circuits and Networks, A.Sudhakar, 4th edition, Tata McGraw Hill, 2011
4. Networks and SystemsAshfaq Husain,2nd edition, Khanna publishing company

Reference Books

1. Engineering Circuit Analysis, William H. Hayt Jr., Jack E. Kemmerly, Steven M. Durbin, Tata McGraw:Hill, 6 the dition.
2. Network Analysis, M.E. Van Valkenburg, Prentice Hall,2nd edition.
3. Introduction to Circuit Analysis, Boylestad Robert L. Charles E., Merril Publishing Company.
4. Circuit Analysis, John R. OMalley,Prentice Hall.
5. Network & Systems, D. Roy Choudhary, 2nd edition, New Age publications, 2010.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE204NX: MATERIAL SCIENCE (Open Elective-I)

Teaching Scheme : 04 L + 00 T; **Total:** 04 hours/week **Credits** : 04
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The purpose of this course is to teach students the fundamentals of Engineering Materials.

DESIRABLE AWARENESS / SKILLS

NIL

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to

1. apply concepts in Materials Science to solve engineering problems
2. select materials for design and construction
3. understand the importance of life-longlearning
4. design and conduct experiments, and to analyze data
5. be knowledgeable of contemporary issues relevant to Materials Science and Engineering

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION),,,

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1													
2	3	2													
3	3	1													
4	3	2	1												
5	3	1													

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamentals of Materials [08 Hrs]

Crystal Structure covering, Atomic structure and inter-atomic bonding; Structure of crystalline solids; Lattices, unit cells; Crystal systems, Bravais lattices; Indexing of directions and planes, notations, Inter-planar spacing and angles, co- ordination number, packing factors Defects in Crystals covering, Point defects; Dislocations, Types of dislocations, Burgers vector and its representation; Planar defects, stacking faults, twins, grain boundaries

Introduction to Electrical Engineering Materials [08Hrs.]

Ceramic Materials covering, ceramic structures, silicate structures, processing of ceramics; Properties, glasses; Composite Materials- Introduction, classification, concrete, metal-matrix and ceramic– matrix composites; Electrical & Electronic Properties of Materials: Electrical Conductivity, Electronic and Ionic Conductivity, Intrinsic and Extrinsic Semiconductivity, Semiconductor Devices, Dielectric Properties, Piezo-electricity

Mechanical Properties of Materials [08Hrs.] Concepts of stress and strain, Stress-Strain diagrams; Properties obtained from the Tensile test; Elastic deformation, Plastic deformation. Impact Properties, Strain rate effects and Impact behavior. Hardness of materials

Introduction to Magnetic Materials [08Hrs.] Magnetic Materials, Magnetic fields or quantities, types of magnetism, classification of magnetic materials, soft magnetic materials, H magnetic materials, Ferro, Para Magnetic materials, properties of magnetic materials.

Introduction to Nanomaterials [08Hrs.]

Nano material preparation, Classification of nanostructures, purification, sintering nano particles of Alumina and Zirconia, Silicon carbide, nanoop, nano-magnetic, nano-electronic, and other important nano materials, nanoscale architecture, fundamental structure, chemistry, property relationships in nanomaterials and nanomaterial systems, giant molecular solids. Nano clusters, Bulk Nanomaterials, Nanocrystalline materials, nanocomposities. Nanoscale x-ray.

Text and Reference Books

1. The Science and Engineering of Materials, Askeland D.R., & P.P. Fullay Cengage Learning Publishers, 2007
2. Materials Science and Engineering, William D.Calliste, Adopted by R.Balasubramaniam, Wiley-Eastern,2008
3. Nano Materials: Synthesis, Properties and Applications A.S .Edelstein and R.C. Cammarata Ed, Inst. of Physics Publishing, UK,1998
4. Materials Science and Engineering-A First Course,Raghavan V., Prentice Hall, India2007
5. Introduction to Materials Science for Engineers, James F. Shackelford , Prentice Hall, India, 1996

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE204NY: INDUSTRIAL SAFETY (Open Elective-I)

Teaching Scheme : 04 L + 00 T; **Total:** 04 hours/week **Credits :** 04
Evaluation Scheme: 10 ISA + 30 MSE + 60 ESE **Total marks :** 100
Duration of ESE : 03 Hrs

COURSE DESCRIPTION:

This course contains identification of components needed to provide a safe environment, analyzing result safety and health issues.

DESIRABLE AWARENESS/SKILLS:

NIL

COURSE OUTCOMES:

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

1. understand the basics of safety and its needs and objectives in industries.
2. learn the role and responsibility of safety management and its activities.
3. apply the knowledge of safety for awareness and training programs.
4. apply the safety practices and inspections using strategies that developed through hazard identification analysis.
5. categorize the different hazards and its safety precautions and action in different types of industry.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CORRELATION:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	1
1	3												1		
2	3												2		
3			1	1										2	
4					2		2								
5						3					3	3			2

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Concepts And Statutory Requirements: **[08 Hrs.]**

Introduction – electrostatics, electromagnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate- international standards on electrical safety – first aid-cardiopulmonary resuscitation (CPR).

Electrical Hazards: **[08 Hrs.]**

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications excess energy-current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current.

Chemical Hazards: Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, TLV - Methods of Evaluation, process or operation description, Field Survey, Sampling methodology, Industrial Hygiene calculations, Comparison with OSHAS Standard.

Protection Systems: **[08 Hrs.]**

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection earth fault protection. FRLS insulation-insulation and continuity test-system grounding- equipment grounding earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

Selection, Installation, Operation and Maintenance: **[08 Hrs.]**

Role of environment in selection-safety aspects in application - protection and interlock self diagnostic features and fail safe concepts-lock out and work permit system-discharge rod and earthing devices-safety in the use of portable tools- cabling and cable joints preventive maintenance.

Hazardous Zones: **[08 Hrs.]**

Classification of hazardous zones -intrinsically safe and explosion proof electrical apparatus (IS, API and OSHA standard) -increase safe equipment-their selection for different zones temperature classification-grouping of gases-use of barriers and isolators-equipment Certifying agencies.

Text Books:

1. R.S. Gupta, Handbook of Fire Technology, National Safety Council of India.
2. Major hazard control, A Practical Manual, Inter National Labour Office, 3rd impression
3. Encyclopedia of occupational health and safety, Inter National Labor Office, 4th edition, 1990.

Reference Books:

1. Industrial Safety -National Safety Council of India.
2. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI,Mumbai
Grimaldi and Simonds, Safety Management, AITBS Publishers, New Delhi, 2001.
3. Industrial Safety and Pollution Control Handbook: National Safety Council and Associate
Publishers Pvt. Ltd, Hyderabad (1993).
4. Risk Assessment and Environmental Management: D. Kofi Asvite- Dualy, John Willey & Sons,
West Sussex, England (1998).

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE206N: NETWORK ANALYSIS LAB

Teaching Scheme : Practical 02; **Total:** 02 hours/week **Credits** : 01

Evaluation Scheme : 30 ICA + 20 ESE **Total Marks** : 50

ESE Duration **:** 03 Hrs.

COURSE DESCRIPTION

This course consists of minimum 8 experiments based on theory syllabus of EE203N. Experiments should involve simulation/performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

DESIRABLE AWARENESS / SKILLS

EE203N: Network Analysis

COURSE OUTCOMES

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

1. apply the basics of the electrical networks and theorems.
2. examine behavior of network for step, impulseand ramp functions.
3. estimate two port network functions.
4. describe poles and zero of network functions.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2			2			1	1	1		2	1	1	
2	2	1			2			1	1	1		2	1		
3	3	1	1		1			1	2	1		2	2	1	
4	3	1			3			1	1	1		2	1		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **eight** experiments from the list of experiments provided below shall be performed to cover entire curriculum of course EE203N.

List of Experiments:

1. Perform an experiment to verifythe Thevenin's theorem.
2. Perform an experiment to verifythe Superposition theorem.
3. Perform an experiment to verifythe Norton's theorem.
4. Perform an experiment to verify the Maximum power transfer theorem.
5. Perform an experiment to verify Reciprocity theorem.
6. Perform an experiment to verify Millmann's theorem.
7. Calculate parameter of two port network.
8. Analysis of the time response of R-L and RC circuit to a step, impulse DC Input.
9. To plot time response of R-L-C series circuit to a step D.C. voltage input.
10. To determine thetimeconstant of series &parallel R-L-C resonance circuit.
11. To locatepoles and zeros using MALAB Simulink.
12. Determination of driving point and transfer functions of a twoport ladder network.
13. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.
14. Determination of transient response of current in RLC circuit with step voltage input for under damp, critically damp and over damp cases.

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

EE207N: ANALOG CIRCUITS LAB

Teaching Scheme	**:** Practical 02;	**Total:** 02 hours/week	**Credits**	**:** 01
Evaluation Scheme	**:** 30 ICA + 20 ESE		**Total Marks**	**:** 50
ESE Duration	**:** 03 Hrs.			

COURSE DESCRIPTION

It consists of experiments based on theory syllabus of EE202N. Experiments involve practical performance and simulation performance/design, result and conclusion based on it.

DESIRABLE AWARENESS / SKILLS

EE202N: Analog Circuits

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to

1. calculate rectification efficiency and % regulation of half wave and full wave Rectifiers with and without filters.
2. construct various diode circuits such as clippers and clampers and to observe and analyze waveforms
3. plot characteristics of BJT, FET and MOSFET.
4. demonstrate various circuits using linear ICs.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1							3	3		1			
2	3		1		1				2	3		2		1	1
3	3				1				3	3		1		2	1
4	3				1				3	3		1		1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

List of experiments:

The student shall perform minimum **Eight** experiments of the following-
(Minimum three from Sr. No. 1 to 6 and five from Sr. No. 7 to 15)

1. To build the half wave and hull wave rectifiers with and without filters to calculate ripple factor, rectification efficiency and regulation
2. To perform of the clipper circuits using diodes and observe waveforms.
3. To perform of the clamping circuits using diodes and observe waveforms
4. To determine the input and output characteristics of BJT using DC biasing of CE, CB and CC Configuration
5. To perform the frequency response of RC coupled amplifier using BJT in CE configuration. Find the low and high cut-off frequency and bandwidth.
6. To determine the input and output characteristics of FET, MOSFET.
7. To perform an experiment to build Inverting and Non-inverting amplifier using IC 741 and to observe the output waveforms
8. To perform an experiment Summing amplifier- to build summing amplifier in inverting and non-inverting mode.
9. To perform an experiment to measure op-amp parameters such as input offset voltage, input bias current, input offset current, PSRR and CMRR
10. To perform an experiment to measure slew rate of Op-amp
11. To construct different types of voltage comparators and observe the waveforms on CRO.
12. To construct Voltage limiter and to observe the output waveforms.
13. To construct integrator and differentiator and to observe the output waveforms for various values of R and C.
14. To construct astable and monostable multivibrator using IC 555 and to observe the output waveforms.
15. To build precision rectifiers and to observe the output waveforms.

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

EE208N: COMMUNITY BASED MINI PROJECT

Teaching Scheme	**:** Practical 04 ; **Total:** 04 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 50 ICA	**Total Marks**	**:** 50

COURSE DESCRIPTION:

This course provides the students to apply knowledge to create awareness in the community to make use of energy efficient equipments/ energy conservation/electrical safety etc. and also to design and analyze electrical circuits. Students will be able to interact with the society and develop the skills for the betterment of the society.

COURSE OUTCOMES:

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

1. create awareness in the society for making use of energy efficient equipments/ energy conservation/electrical safety etc
2. develop the circuit for the model useful for soiety.
3. make use of software for simulation of circuit.
4. select proper components and fabricate electrical circuit.
5. test and record the performance for the circuit.

GUIDELINES:

Each student shall work on an approved project, a group of 3-5 students (maximum) shall be allotted for each minor project and same group may be continued for major project.

The students may focus on socio-economic conditions, social survey and about the Government's social security schemes. Mini project may involve survey to create awareness in the society. The survey in the community may involve the various problems faced and to create awareness in the various aspects such as -

1. Use of energy efficient equipments
2. Awareness to energy conservation
3. Electrical safety
4. Use of renewable energy in day to day life
5. Power quality issues
6. Use of solar pumps
7. Use of solar cooker
8. Study of Domestic/commercial/industrial electric bill

The sample list given above is just a guide line and course co-ordinator can add similar activities.

The community based mini project may also involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas related to community. The project work shall involve sufficient work so that students will get acquainted with different aspects of fabrication, design or analysis.
Each student is required to maintain separate log book for documenting various activities of community based mini project.

Three-member committee appointed by Head of the department shall be constituted for internal assessment of mini project.

Assessment of Mini Project

Name of the Mini Project: _____

Name of the Guide: _____

Evaluation may contain:

Sr. No.	PRN	Name of the Student	Name of the mini Project	Problem identification and solving or collaborative work or involvement in production centre (10)	Presentation (5)	Report Writing (5)	Que/ Ans (5)	Total (25)

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1					2							1		
2	2						2							1	
3	2						2								
4	1						1								
5	1							3							

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

EE251N: DC MACHINES & TRANSFORMER

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The aim of introducing this course is to impart knowledge of basic energy conversion in DC machines and transformer. Through the study of this course the students will get adequate knowledge of construction, working, classification and performance of electrical machines

DESIRABLE AWARENESS / SKILLS

EE101N: Basic Electrical Engineering

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to -

1. Understand the fundamental principles of electromechanical energy conversion systems
2. Analyze different types of DC generators their characteristics, industrial applications, effect of armature reaction and its assessment
3. Compute the performance parameters of dc machines and select proper DC machine for industrial applications.
4. Identify proper transformers for various applications and analyze the performance of transformer using equivalent circuits.
5. Explain various types of connections and parallel operation of three phase transformers

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2										1			
2	3	2	1					1	1	2		1	1	1	1
3	3	2						1	1	1		1	1	1	1
4	2	2						1		1		1	1	1	
5	2	1						1	1				1		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Electromechanical Energy Conversion: [08 Hrs]

Principle of electromechanical energy conversion, singly excited magnetic system and doubly excited magnetic system, torque production in rotating machines and general analysis of electro mechanical system.

DC Generators: [08 Hrs]

Working principle, construction. armature winding: simplex lap and wave windings. EMF equation, methods of excitation – separately and self-excited, shunt, series, compound. Voltage build-up, critical resistance, no load characteristics, load characteristics, applications of DC generators. Losses and efficiency, power flow diagram. Armature reaction, demagnetizing & cross magnetizing ampere-turns, compensating windings, inter poles.

DC Motors: [08 Hrs]

Principle of operation, back EMF, classification, torque equation, losses and efficiency, power flow diagram. Performance characteristics of shunt, series and compound motors, starting of DC motors, necessity and types of starters, speed control – methods of speed control, losses in dc machine, power flow diagram , efficiency , testing of DC machines- Swinburne's Test, Hopkinson's Test.

Single Phase Transformer: [08 Hrs]

Review of transformer, equivalent circuit, voltage regulation, losses and efficiency, all day efficiency. Testing- Direct loading, open and short circuit tests, polarity test, Sumpner's test, separation of hysteresis and eddy current losses. Autotransformers - construction, principle, applications and comparison with two winding transformer.

Three Phase Transformer: [08 Hrs]

Construction, various types of connections and their comparative features, vector groups. Scott connection and open delta connection. Parallel operation of single and three phase transformers, Tap changing transformer, no load and on load tap changing. Three winding transformer. .

Text Books:

1. Electrical Machines, D. P. Kothari and I. J. Nagrath, 5th Edition,Tata McGraw Hill, New Delhi, 2017.
2.Electrical Machines A. Chakrabarti and S. Debnath, McGraw Hill, 2015
3. Electrical Machines, S. K. Bhattacharya, Third edition, McGraw Hill, 2009.
4. Theory and Performance of Electrical Machines,J.B.Gupta, Kataria and sons, ,14th edition Delhi.
5. Electric Machinery,P. S. Bimbhra, Khanna Publishers, 2nd Edition, 2021.

Reference Books:

1 Electric Machinery A. E. Fitzgerald, C. Kingsley and S. D. Umans,6th editionTata McGraw Hill, New Delhi.
2. Electrical Machines, P. Purkait and I. Bandopadhyay,Oxford University Press, 1st edition, 2017.
3. M. G. Say, "Alternating Current Machines",5th revised edition, Pitman Publishing,1984

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any **two** of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE252N: POWER GENERATION, TRANSMISSION & DISTRIBUTION

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course provides an introduction to generation, transmission and distribution of power system. This course also provides knowledge of different parts and auxiliaries in power plants. This course also provides introduction of different components of transmission system, concept and calculation of transmission line parameters.

DESIRABLE AWARENESS / SKILLS

EE101N : Basic Electrical Engineering

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to -

1. demonstrate working of various power plants
2. compute various factors of generation plants.
3. compute the conductor size and trasmismission voltage for the transmission line
4. evaluate the transmission line constants
5. demonstrate the corona effect.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3		2	1	2	3	1			2			1		
2	3	2	2	2	2									2	
3	3			3	2			3	3	3				2	
4	3		1	2	1	2									3
5	1		2	3		3		1							1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Conventional and Non Conventional Power Generation: [08 Hrs.]

Study of Hydro-electric, Thermal, Nuclear and Diesel power plants: Schematic block diagram, principle of working, main components and auxiliary components, site selection criteria, advantages and disadvantages.

Study of solar and wind power plants.

Economic Aspects And Load Calculations: [08 Hrs.]

Structure of electric power system, load curves, important terms and factors, Units generated per annum, load duration curves, types of loads, typical demand and diversity factors. Important points in selection of generating units, base load and peak load on power stations, method of meeting the load,economics of power generation, cost of electrical energy and differentiation.

Supply systems: Typical layout of an electrical power system, comparison of D. C. and A. C. transmission, advantages and disadvantages of high transmission voltage. economics of power transmission,economic choice of conductor size and transmission voltage,introduction to tariff and its calculation.

Mechanical Design of Overhead Lines: [08 Hrs.]

Overhead Line Insulators: Main components of overhead lines, conductor materials, line supports, insulators, potential distribution over suspension insulator string, methods of improving string efficiency, The centenary curve, sag tension calculations, supports at different levels, stringing chart.

Insulated Cables: Introduction, insulation, insulating materials , construction of cable, and types of cables, dielectric stress in single core cable,most economical conductor size of cable, grading of cables, insulation resistance of cable.

Transmission: [08 Hrs.]

Line constants: Line constants, resistance of a transmission line, skin effect, proximity effect, Ferranti Effect, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, GMD and GMR, Composite conductors- transposition, bundled conductors.

AC Distribution: [08 Hrs.]

Classification of distribution systems, Various methods of Distribution, general, radial and ring main systems, AC distribution Calculation Methods of solving A.C. Distribution Problem, 3-Phase unbalanced loads,

Introduction to power factor improvement and corona effect.

Text Books:-

1. Elements of Power System Analysis, William Stevenson, 6th Edition, Tata McGraw, 2006
2. Modern Power System Analysis, J. Nagrath& D. P. Kothari, 3rd Edition, Tata McGraw Hill Publishing Company, New Delhi, reprint2010

Reference Books:-

1. Power System Analysis, Hadi Saadat, McGraw Hill,2003
2. Electrical Wiring, Estimation and Costing by S.L. Uppal, Khanna Publishers, NewDelhi, 1987
3. Power System by C.L. Wadhava, New Age International Publishers, 6th Edition, 24 April 2018

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any one or combination of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE253N: DIGITAL CIRCUITS

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03
Evaluation Scheme : 10 ISA + 30 MSE + 60 ESE **Total Marks** : 100
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The course will help the students to learn facts, concepts, principle of digital electronics. The techniques can be used for designing sequential and combinational circuits which forms the basis of any electronic device. Also, this course is designed to give clear idea about working principles of 8085 microprocessor, architecture, assemble language programming and interfacing of peripherals and their applications.

DESIRABLE AWARENESS / SKILLS

EE202N-Analog Circuits

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to -

1. explain digital codes, number systems and operation of the logic gates
2. understand K-map and design simple combinational logic circuits
3. understand flip-flops and design simple sequential logic circuits
4. describe the features and architecture of 8085 microprocessor and develops the program using the various addressing modes and instructions set of 8085 microprocessor.
5. apply the knowledge for interfacing I/O devices to 8085 microprocessors.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	1	1	1			1	2	1					
2	2	1	1	2	1			1	2	1	1	2	1	1	1
3	2	2	1	2	1			1	2	1					
4	2	2	1	1	2			1	2	1	2	1		1	
5	2	2	1	1	1			1	2	1	2	2	1	1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamentals of Digital Electronics: [7 Hrs.]

Number systems - Binary, octal and hexadecimal number systems, their conversions and arithmetic, 1's and 2's complements; Weighed and non-weighted codes, BCD codes, Excess-3 code, Gray code, Error correcting and detecting codes; Logic gates and logic families, Boolean algebra, DeMorgan's Theorem.

Combinational Logic Circuits: [8 Hrs.]

Introduction to Karnaugh map, Minterms and maxterms representation of logical functions, Sum of product and product of sum form minimization, Redundant terms, Design of combinational logic circuits, Design of half adder and subtractor, Design of full adder and subtractor, BCD to seven segment decoder, IC 7447, Multiplexer, Cascading of multiplexer; Demultiplexer, Cascading of demultiplexer, Multiplexer and demultiplexer ICs.

Sequential Logic Circuits: [8 Hrs.]

Flip-Flops: R-S, D, J-K, T, Master slave flip-flops, their conversion.

Counters: Different types of counters, Design of divide by N asynchronous and synchronous counters, Design of BCD, Decade, Up-down counter.

Shift Registers: Data-in and data-out modes, SISO, SIPO, PISO and PIPO modes, Left shift and right shift register; Universal shift register.

Fundamentals of 8085 Microprocessor: [10 Hrs.]

Introduction to microprocessors, Features of 8085 microprocessor, Pin diagram, Architecture, Register, Addressing modes, Stack, Subroutines, Interrupt and interrupt structure, Interrupt service routines (ISR) and their priority, Memory organization.

Microprocessor Instructions and data transfer scheme: Classification of instructions, Instruction set , Assembly language programs based on data transfer, Arithmetic instruction, Logical instruction with 8/16 bit data, Data transfer schemes**,** I/O mapped I/O and memory mapped I/O, Synchronous and asynchronous data transfer schemes, Memory interfacing..

Interfacing Peripherals and Applications: [7 Hrs.]

Study of architecture, Different modes and interfacing of operation of PPI 8255, PIT 8253, USART 8251,PIC 8259, Interfacing of seven segment display, Stepper motor, ADC (0809), DAC(0808), Microprocessor based development systems, Simulators, Emulators and logic analyzers

Text Books

1. Modern Digital Electronics,R. P. Jain , Tata McGraw Hill Publications
2. Microprocessor Architecture, Programming, & Applications" with 8085, R.A. Gaonkar , 3rd Edition, Penram International Publication (India) Pvt. Ltd.1997

Reference Books

1.Fundamentals of Digital CircuitsAnand Kumar, Prentice-Hall India.
2.Digital Principles and Applications, Malvino and Leach, McGraw Hill Publications.
3.8085 Microprocessor and its Applications,ANagoorkani, 3rd EditionMcGraw Hill Publications

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any one or combination of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE254NX: ELECTRIFICATION OF BUILDINGS (Open Elective-II)

Teaching Scheme : 02L, Total: 02 **Credits :** 02
Evaluation Scheme: 30 MSE + 10 ISA + 60 ESE **Total marks:** 100
Duration of ESE : 03 Hrs

COURSE DESCRIPTION:

This course contains electrification of high rise buildings and complexes. Studying this course will enable the diploma pass outs to plan, design, and estimate and execute the electrification of multistoried buildings and commercial complexes independently and professionally as per IE rules.

DESIRABLE AWARENESS/SKILLS:

Knowledge of Basic Electrical and Basic Electronics

COURSE OUTCOMES:

After going through this course, the student gets a working knowledge on:

1. enterpret the lighting scheme of the given situation
2. compare the salient features of the given type of lamps
3. expalin with sketches the given type of control circuit for lamps
4. estimate the illumination schme for given type of building
5. design illumination scheme for various application

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CORRELATION:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	1
1		2	2			2									
2													2		
3					1										1
4			1									3		1	
5	1								3	3	3				2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamentals of illumination [05 Hrs.]

Basic illuminatio, terminology, laws of illuminations. Polar curves, polar curve: its meaning and applications for designing lamps. Concept of hotometry. Measurement of illuumination. Lighting calculationmethod: a) Watt/m2 method b) lumen or light flux method c) point by point method. standards of illumination

Types of lamps [05Hrs.]

Incadicent lamp. Arc Lamp- AC DC Arc Lamps. Fluorecent Lamp. Types of other lamps: Mercury vapour Lamp, Mercury lodide lamp, sodium vapour lamp, LED , CFL, Halogen Lamps, Ultraviolet Lamp, Neon Lamp, Neon Sign Tubes, Metal Halides, Lasers. HID and Arc Lamps. Selection criteria for lamps

Illumination Control and Control Circuits [06Hrs.]

Purpose of lighting Control, and dimmer, resistance type salt water dimmer. Working principle and operation of dimmers. Transformer and teir types, dimmer transformer, auto transformer dimmer, two winding transformer dimmer. Electronic dimmer: working princple and operation a) thyrister operated dimmer b) TRIAC operated dimmer. Control of enhance lighting. Method used for lght control. Control circuits for lamps: single lamp controlled by single switch, two switch. Single lamp controlled by two point metod and four point method. Control circuit fo r lamps: ON/ OFF control

Illumination for interior Applications [05 Hrs.]

Standard for various locations of interior illlumination. Design considration for interior location of residene(1/2/3/4 BHK), commercial, industrial Premises. Illumination scheme for different interior locationof residential, commercial, industrial units.

Lighting for outdoor special applications [05 Hrs.]

Factory Lighting. Street Lighting(Latest Technology), Flood Lighing. Railway Lighting. Lighting for advertisement/ hording/ sports lighting, agriculture and horticulture lighting, health care centre/ hospital, decorating purpose, stae lighting, Aquariums and shipyards. Special purpose lamps used in photography video flims.

Text Books:

1. Electrical Wiring Estimating and Costing. by S. L. Uppal, Paperback.
2. A Course in Electrical Installation Estimating and Costing. by J.B. Gupta, : S K Kataria & Sons.
3. Raina. K. B.& Bhattacharya. S.K. Electrical Design Estimating and Costing: New Age International.

Reference Books:

1. Utilization of electrical energy, by E.O.Taylor.
2. Electrical Drives: Concept and applications by VedamSubrahmanyam, THM.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any one or combination of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE254NY: WIND AND SOLAR POWER SYSTEM (Open Elective-II)

Teaching Scheme : 02 L, Total: 02 **Credits :** 02
Evaluation Scheme: 30 MSE + 10 ISA + 60 ESE **Total marks:** 100
Duration of ESE : 03 Hrs

COURSE DESCRIPTION:

This course contains a brief introduction to wind and solar power generation. Also, it includes practical approach such as design of solar and wind power plant for various applications.

DESIRABLE AWARENESS/SKILLS:

Knowledge of Basic Electrical and Basic Electronics

COURSE OUTCOMES:

On the successful completion of this course, student will be able to

1. analyze basic Concepts of Solar Energy.
2. understand generation schemes with both constant & variable speed turbines and different types of generators.
3. estimate wind power plant.
4. classify Wind Power Generation Schemes.
5. understand wind integration.

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CORRELATION:

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2		2						3						
2	1													2	
3			1									3		2	
4												3			3
5				1								3	3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Basic Concepts of Solar Energy and Solar Cells: [05 Hrs.]

Introduction to solar energy. Terrestrial and Extraterrestrial Solar Radiation. Characteristics of Solar Radiation & Radiation Spectrum. Solar Constant. Air mass ratio. Geometry of Earth and Sun. Atmospheric effects on solar radiation. Solar radiation measurement & Instrumentation. Types of Solar Cells - Mono crystalline & Poly crystalline. Solar cells-Energy requirement, Basic operation, construction & concepts.

Solar Cell Characteristics, BOS and Classification of PV Systems: [05 Hrs.]

Solar cell I-V characteristics. Maximum Power Point. Cell efficiency & Fill factor. Effect of Irradiation and Temperature. Principles of Maximum Power Point Trackers. PV Arrays and Modules. Balance of Systems (BOS)- Inverters, Batteries, Charge controllers. Classification of PV Systems - Stand- alone PV system - Grid Interactive PV System- Hybrid Solar PV system.

Fundamentals of Wind Turbines: [05 Hrs.]

Power contained in wind - Efficiency limit for wind energy conversion. Design of wind turbine rotor: Diameter of the rotor - Choice of number of blades - The tower- Transmission system and Gear box - Power speed characteristics - Torque speed characteristics. Wind turbine control systems - Pitch angle control, Stall control, Yaw control, Control strategy.

Classification of Wind Power Generation Schemes and Self Excited Induction Generators: [06 Hrs.]

Criteria for classification-Fixed and Variable speed wind turbines- Electrical Power Generators-Self excited vs. Grid connected Induction Generators. Classification of Wind Power Generation Schemes. Advantages of variable speed systems. Induction Generators-Basic Principle of operation-Operation in self excited mode-Initial Voltage build up -Limitations. Methods to overcome limitations - Controlled firing angle scheme with AC side capacitor-Inverter/converter system with DC side capacitor.

Integration of Wind Turbine Systems: [05 Hrs.]

Grid Integration challenges and solutions- power electronics for renewable energy system- energy storage options and applications- microgrid and distributed generations concept.

Text Books:

1. Wind Electrical Systems, S.N. Bhardra, D.Kastha and S.Banerjee, Oxford University Press.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.
3. Wind and Solar Power Systems- Mukund R. Patel. CRC Press Boca Raton-London-New York, Washington, D.C. 1999
4. Solar PV and Wind Energy Conversion Systems. An Introduction to Theory, Modeling with MATLAB/SIMULINK, and the Role of Soft Computing Techniques' S. Sumathi , L. Ashok Kumar & P. Suresh. Springer

Reference Books:

1. Grid integration of wind energy conversion systems. H. Siegfried and R. Waddington. John Wiley and Sons Ltd., 2006.
2. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
3. Solar Cells from Basics to Advanced Systems, Chenming Hu and Richard M. White, Tata McGraw Hill.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any one or combination of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

EE256N: DC MACHINES & TRANSFORMER LAB

Teaching Scheme : 02 P; Total: 02 hours/week **Credits** : 01
Evaluation Scheme : 30 ICA+20 ESE **Total Marks** : 50
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

This course deals with the practical exposure to conduct various tests to evaluate performance parameters of transformer, DC Machine and three phase transformer.

DESIRABLE AWARENESS / SKILLS

EE251N:Electrical Machine-I

COURSE OUTCOMES

On the successful completion of this course, the students shall be able to

1. select the range of apparatus based on the ratings of DC. Machine and transformer
2. operate DC machines under different load conditions.
3. perform various tests on DC machines.
4. evaluate t he performance parameters of single phase and three phase transformers.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	1							3	3		1			
2	3		1		1				2	3		2		1	1
3	3				1				3	3		1		2	1
4	3				1				3	3		1		1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **eight** experiments from the list of experiments provided below shall be performed to cover entire curriculum of course EE251N.

List of Experiments:

1. To plot Magnetization of a DC shunt/series generator.
2. To plot load and internal characteristics of a DC shunt/series generator.
3. To control Speed of a DC Shunt motor by- (i) armature voltage control and (ii) Field current control method.
4. Load/break test on DC shunt/series motor.
5. To determined efficiency of a DC machine by Swinburne's test.
6. To perform Polarity test on single phase and three phase transformer
7. To determined efficiency and regulation of single phase transformer by direct loading
8. To determined efficiency and regulation of single phase transformer by using Open circuit and short circuit tests
9. To determinedequivalent circuit parameters of single phase transformer by using Open circuit and short circuit tests
10. To perform Parallel operation of two single-phase transformers under various conditions.
11. Voltage and current ratio of different connection of three phase transformer(star-star, star-delta, delta-star, delta-delta)
12. To perform V-connection of identical three phase transformers.
13. To perform Scott-connection on three-phase to two-phase transformation.
14. To perform Sumpner's test on transformer
15. Study the conventional and industrial starters ford.c. motor

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

EE257N: DIGITAL CIRCUITS LAB

Teaching Scheme	**:** Practical: 02 Total: 02 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION:

The laboratory work should consist of experiments based on theory syllabus of EE253N. Experiments involve simulation performance/design of practical, result and conclusion based on it.

DESIRABLE AWARENESS / SKILLS

EE253N: Digital Circuits

COURSE OUTCOMES:

On the successful completion of this course, the students shall be able to -

1. identify logic gates from IC numbers and to construct basic logic gates from universal gates.
2. construct combinational logic circuits and sequential logic circuits.
3. provide hands on skill on microprocessors, design and coding knowledge on 80x85 family.
4. develop the assembly language program using various microprocessors tool.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	1	1	1			1	2	1					
2	2	1	1	2	1			1	1	1	2	2	1	1	1
3	2	2	1	1	1			1	2	1					
4	2	2	1	1	1			1	2	1	2	1		1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

The student shall perform minimum **EIGHT** experimentsto cover entire curriculum of course EE253N of the following. The list of experiments provided below is just a guideline.(Minimum four from Sr. No. 1 to 9 and any four from Sr. No. 10 to 20)

List of Experiments:

1. To verify truth table and identify IC numbers of basic logic gates.
2. To build basic logic gates using universal gates
3. Verification of Demorgan's Theorem
4. Design and implementation of any two combinational logic circuits based on examples such as to find majority of ones, to find numbers exactly divisible by 3 or 4 etc.
5. To design arithmetic circuits such as half and full adder, half and full subtractor.
6. To verify truth table of different flip-flop ICs.
7. Design of mod-2, mod-5, mod-7 or 8 or 9, mod-10 and reverse mod-10 counter using IC 7490.
8. Study of multiplexer and function realization using data selector ICs
9. Study of demultiplexer and function realization using data selector ICs
10. Study of architecture and instructions set of 8085
11. Microprocessor 8085 assembly language programs based on arithmetic instruction, with 8/16 bit data i) Addition of two 8 bit /16 bit number ii) Subtraction of two 8 bit /16 bit number
12. To study of data transfer instructions move the data from one place to another place
13. To study microprocessor 8085 assembly language programs logical instruction, code conversions
14. Microprocessor 8085 assembly language programs based on any interrupt.
15. To find the largest and smallest number in an array of data using 8085 instruction set
16. To write a program to arrange an array of data in ascending and descending order.
17. To study the interfacing of 8255 PPI with 8085
18. To study the interfacing of 8279 with 8085
19. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes
20. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.