

## UNIVERSITY OF JAMMU, JAMMU

**COURSE SCHEME**  
**B.E. 3<sup>RD</sup> SEMESTER ELECTRICAL ENGINEERING**  
**FOR EXAMINATION TO BE HELD FOR THE BATCH 2014 AND ONWARDS**

Course		Hours/Week			Marks			
Course Code	Title	L	T	P	Theory	Sessional	Practical	Total
ECE-302	Electromagnetic Field and Transmission Lines Theory	3	2	0	100	50	--	150
MTH-311	Engineering Mathematics-III	3	2	0	100	50	--	150
M-314	Thermal Engineering	3	2	0	100	50	--	150
EE-301	Principle of Electrical Engineering	4	2	0	100	50	--	150
EE-302	Network Analysis & Synthesis	4	2	0	100	50	--	150
EE-303	Non Conventional Energy Resources & Applications	3	2	0	100	50	--	150
EE-308	Electrical and Electronics Workshops	0	0	2	---	--	50	50
EE-309	Principle of Electrical Engineering Lab	0	0	2	---	--	50	50
<b>Total</b>		<b>20</b>	<b>12</b>	<b>04</b>	<b>600</b>	<b>300</b>	<b>100</b>	<b>1000</b>

**CLASS: B.E. 3<sup>RD</sup> SEMESTER****BRANCH: EE/ECE****COURSE CODE: ECE-302****TITLE: ELECTROMAGNETIC FIELD AND TRANSMISSION LINES THEORY****DURATION OF EXAM: 3 HOURS**

Hours/week			Marks distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

**SECTION - I**

**ELECTROSTATICS:** Revision of vector analysis with, Spherical & polar coordinates, Electrostatic Potential, potential, Potential gradient, Gradient operator, Conductors, Method of images, Energy density in electrostatics field, Electric field in dielectric media, Capacitance, Solution of Electrostatic problems using Poisson's & Laplace equation.

**MAGNETOSTATICS:** Magnetic flux density, & Magnetic potential, Torque on a closed circuit, Energy density in the magnetic field.

**MAXWELL EQUATION UNIFORM PLANE WAVE:** Application of Maxwell equation to circuits, Resonant cavity, Radiation antennas, Rotating magnetic field theory, Wave motion in perfect dielectric, Wave motion in perfect dielectric, Plane wave in lossy dielectric, Propagation in good conduction, Skin effect, Pointing theorem, Standing wave ratio, Polarization, Reflection of uniform plane wave,

**SECTION – II**

**TRANSMISSION LINE:** Basic principles of T.L, Equivalent ckt of T.L, Basic transmission line equation, Input impedance, infinite T.L, Characteristics impedance ( $Z_0$ ), Propagation constant, attenuation constant, Phase constant, open and short circuits T.L, Velocity, wavelength, Voltage and power on line. Distortion in line Reflection and its coefficient,

**LINE AT HIGHER FREQUENCY:-** Line Equation, Waveform on line terminated in various impedances, SWR, & its relation with reflection coefficient. Impedance of short Circuit and open Circuit line. Characteristic of  $\lambda/2$  &  $\lambda/4$  lines. Principle of Impedance matching & use of smith chart for impedance matching using  $\lambda/4$  transformer & single stub.

**RECOMMENDED BOOKS:**

- |     |                                 |                     |
|-----|---------------------------------|---------------------|
| 01. | Engineering Electromagnetic     | Jseph A. Edminister |
| 02. | Introduction to Electromagnetic | Griffith            |
| 03. | Engineering Electromagnetic     | Jr. Hyat            |
| 04. | Network Line & Filters          | J.D. Rayder         |
| 05. | Antenna & Wave Propagation      | .D. Prasad          |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. <sup>3RD</sup> SEMESTER**  
**BRANCH: EE/ECE**  
**COURSE CODE: MTH-311**  
**TITLE: ENGINEERING MATHEMATICS-III**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION - I

#### LAPLACE TRANSFORMS:

Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms, LT of unit step function, Impulse function, Periodic function, Initial value theorem, Final value theorem, Convolution theorem, Application of LT to solve linear differential equations and convolution type integral equations.

#### INTEGRAL TRANSFORMS AND FOURIER INTEGRALS:

Integral transforms and Fourier Integrals Fourier integral theorem, Fourier sine and cosine Integrals, and their inverses.

### SECTION - II

#### SPECIAL FUNCTIONS:

Special Functions Legendre polynomials, Rodrigue's formula, Recurrence formulae, generating function, Orthogonality of Legendre polynomials, Bessel function of 1st kind. Recurrence formulae, generating function, Orthogonality of Bessel function.

#### BOOLEAN ALGEBRAS:

Boolean Algebras, Lattices, Finite Boolean algebra, C.N.F and D.N.F, Application of Boolean algebra to switching theory.

#### RECOMMENDED BOOKS:

- |     |                                |                 |
|-----|--------------------------------|-----------------|
| 01. | Higher Engineering Mathematics | B.S. Grewal     |
| 02. | Boolean Lattices               | V.K. Khanna     |
| 03. | Engineering Mathematics-III    | Bhopinder Singh |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**  
**BRANCH: EE/ECE**  
**COURSE CODE: M-314**  
**TITLE: THERMAL ENGINEERING**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### UNIT-1

#### THERMODYNAMICS:

Dimensions and units, Basic concepts, Zeroth Law, Temperature scale. First Law of Thermodynamics for closed system and open system, applications, general energy equation for steady flow.

Second Law of Thermodynamics, Reversible and Irreversible processes, Carnot cycle, Clausius theorem, Entropy, entropy change, Clausius inequality, Principle of increase of entropy.

Ideal gases and process calculations.

### UNIT-2

Principles of Refrigeration, Vapour compression cycle, Components of Vapour compression systems, COP and related calculations

### UNIT-3

**BOILERS:** Fire tube and Water tube boilers- description and special features, fields of application.

### UNIT-4

Properties of steam and process calculations.

Vapour Power Cycles: Carnot's cycle, Rankine cycle, and elementary cycle calculations.

Nozzles: Types, Nozzle efficiency, Critical pressure ratio, Throat and exit areas.

#### RECOMMENDED BOOKS:-

- |    |                            |                   |
|----|----------------------------|-------------------|
| 1. | Heat Engineering           | Vasandani & Kumar |
| 2. | Engineering Thermodynamics | Gupta & Prakash   |
| 3. | Engineering Thermodynamics | PK Nag            |

**NOTE :** There shall be total eight questions, two from each unit. Five questions have to be attempted selecting at least one question from each unit. Use of calculator is allowed.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**  
**BRANCH: EE/ECE**  
**COURSE CODE: EE-301**  
**TITLE: PRINCIPLE OF ELECTRICAL ENGINEERING**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
4	2	0	100	50

### SECTION-I

**Electric Circuit Laws & Energy Sources:** Basic electric circuit terminology, Ohm's law, Kirchoff's laws, Circuit parameters (Resistance, inductance & capacitance), series & parallel combination of resistance, inductance & capacitance. Ideal & practical voltage and current sources and their transformation. Dependent voltage sources and dependent current sources.

**D.C. Circuit Analysis:** Power and energy relations, analysis of series parallel D.C. circuits, Star-Delta transformation, Superposition theorem, Mesh & Nodal methods, Thevenin's theorem, Narton's theorem, Maximum power transfer theorem. Reciprocity Theorem

A.C. Circuit: Basic terminology and definition, Average and effective values of periodic functions, instantaneous and average power, Power factor. Phasor and complex number representation.

### SECTION-II

**A.C. Circuit Analysis:** Solution of sinusoidally excited R, L, C circuits, Applications of above mention Network theorems to A.C. circuits. Resonance in series and parallel circuits; quality factor.

**Steady State A.C. 3-Phase Circuits:** Concept of 3-phase voltage, Wye (y) circuits, Delta circuits current and voltage relations in Wye and delta circuits. Measurement of power in three phase balanced circuits.

**Transformer:** Construction, operating principle No-load and On-load vector diagrams, Equivalent circuit, regulation and efficiency calculations, Transformer test (open circuit & short circuit). All day efficiency.

#### RECOMMENDED BOOKS:

- |  |                |
|--|----------------|
| 1. Electrical Engineering Fundamentals | V. Del toro    |
| 2. Electrical Technology               | H.Cotton       |
| 3. Electrical Technology               | E.Hughes       |
| 4. Circuit Theory                      | A.K.Chakorbari |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**  
**BRANCH: EE/ECE ENGINEERING**  
**COURSE CODE: EE-302**  
**TITLE: NETWORK ANALYSIS & SYNTHESIS**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
4	2	0	100	50

### SECTION-I

**Conventions for describing networks:** Reference directions for currents and voltages, conventions for magnetically coupled circuits, circuit topology.

**First order differential equation:** Differential equations as applied in solving networks, Application of initial conditions, evaluating initial conditions in networks.

Laplace Transformations: Solution of network problems with Laplace transformation, Heavisides Expansion theorem

**Wave Form Analysis & Synthesis:** The unit set ramp and impulse functions and their Laplace transforms, Initial and final value theorems, convolution integral, convolution as summation.

### SECTION-II

**Network Functions-poles and zeroes:** Ports or terminal pairs, Network functions for one port and two port networks (ladder and general networks), Poles and Zeros of network functions, Restriction on pole and Zero locations for driving point and transfer functions. Time domain behaviour from pole Zero plot.

**Two port parameters:** Admittance, impedance, transmission and hybrid parameters, Relationship between parameter sets, parallel, series & Cascade connection of two port Networks, Characteristics impedance of two port networks.

**Filters:** Filter fundamentals- pass and stop band, filter classification, constant K & m derived filters, Behaviour of characteristics impedance over pass & stop bands, design of filters.

**Network Synthesis:** Synthesis problem formulation, properties of positive real functions. Hurwitz polynomials properties of RC, LC and RL driving point, functions. Foster and Caue synthesis of LC,RL and RC circuits.

### RECOMMENDED BOOKS:

- |    |  |                      |
|----|--|----------------------|
| 1. | Network Analysis                             | Van Valkenberg       |
| 2. | Network Analysis & Synthesis                 | F.F. Kuo             |
| 3. | Introduction to Circuit Synthesis & Design   | Temes & La Patra     |
| 4. | Fundamentals of Network Analysis & Synthesis | Perikari             |
| 5. | Network Theory & Filter Design               | V. Atre              |
| 6. | Network analysis and Synthesis               | Sudhakar Shyam Mohan |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-303**  
**TITLE: NON CONVENTIONAL ENERGY RESOURCES & APPLICATIONS**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION-I

**Introduction:** Limitations of conventional energy sources need & growth of alternate energy sources, basic schemes and applications of direct energy conversion.

**MHD Generators:** Basic Principles and Half effect, generator and motor effect, different types of MHD generators, conversion effectiveness. Practical MHD generators, applications and economic aspects.

**Solar Energy:** Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications. Solar energy in India, solar collectors, solar furnaces & applications.

**Wind Energy:** History of wind power, wind generators, theory of wind power, characteristics of suitable wind power sites, scope in India.

### SECTION-II

**Thermo-electric, Generators:** Seeback effect, peltier effect, Thomson effect, thermoelectric convertors, brief description of the construction of thermoelectric generators, applications & economic aspects.

**Fuel Cells:** Principle of action, Gibbs free energy, general description of fuel cells, types, Construction, operational characteristics and applications.

**Miscellaneous Sources:** Geothermal system, Characteristics of geomothermal resources, choice of generators, electric equipment and precautions. Low head hydro plants, definition of low head hydro power, choice of site and turbines. Tidal energy, idea of tidal energy, Tidal electric generator, limitations.

### RECOMMENDED BOOKS:

- |   |                           |
|---|---------------------------|
| 1. Non conventional Energy Resources          | D.S. Chauhan              |
| 2. Conventional energy sources                | G.D. Rai                  |
| 3. Non Conventional energy sources            | B.H. Khan                 |
| 4. Solar Energy Fundamentals and Applications | H.P. Garg and Jai Prakash |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**  
**BRANCH: EE/ECE ENGINEERING**  
**COURSE CODE: EE-308**  
**TITLE: ELECTRICAL AND ELECTRONICS WORKSHOPS**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	50

### SECTION-I

**Study of Wires & Cables:** Study of various type of wiring, Cost estimation for wiring of a single storied building having light & power circuits, Method of earthing & measurement of earth resistance, Electrical shock precautions & treatment, jointing of wires & cables, Soldering of joints, Wiring practices in PVC, Conduit system of wiring, Control of fluorescent lamp circuit power & ordinary circuits suitable for domestic wiring.

### SECTION-II

**Familiarization with Various Electronic Components:** Resistor, Capacitors, Transistors, Diodes IC's, Transformer, Assembly of signal phase, Full wave rectifier circuit with capacitor filter, Assembling the common emitter amplifier circuit, Assembling the following circuit comprising of IC's on a bread board, Like timer circuit using IC 555 & Fabrication on General purpose PCB (to get familiar with soldering techniques).

### BOOK RECOMMENDED:

1. Electrical Wiring & Estimation S.I. Uppal

**NOTE :** The Electronic circuit diagrams will be provided to the students. The operation of the circuits will be explained. The purpose of the exercise is to familiarize the students Fabrication/Assembling of the given Electronic circuits and to solder the different components to form different Circuits.

**CLASS: B.E. 3<sup>RD</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-309**  
**TITLE: PRINCIPLE OF ELECTRICAL ENGINEERING LAB.**

Hours/Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	50

**LIST OF EXPERIMENTS:**

1. Verification of Kirchoff's Laws.
2. Verification of Superposition Theorem.
3. Verification of Thevinin's Theorem.
4. Verification of Reciprocity Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. Measurement of current in various branches of RLC series-parallel circuit.
7. Single phase power measuring by using a Wattmeter.
8. Study of three-phase A.C Circuits with Star and Delta connected Load.
9. Study of single phase transformers. Determination of voltage Ratio, Turns Ratio and Polarity Test. Open circuit and short circuit test of given single phase transformer. Determination of regulation and efficiency.

## UNIVERSITY OF JAMMU

**COURSE SCHEME**  
**B.E. 4<sup>th</sup> SEMESTER ELECTRICAL ENGINEERING**  
**FOR EXAMINATION TO BE HELD FOR THE BATCH 2014 AND ONWARDS**

Course		ours/Week			Marks			
Course Code	Title	L	T	P	Theory	Sessional	Practical	Total
MTH-411	Engineering Math-IV	3	2	0	100	40	-	140
EE-401	Electrical Machines-I	3	2	0	100	40	-	140
ECE-416	Analog Electronics-I	3	2	0	100	40	-	140
EE-402	Control Systems-I	3	2	0	100	40	-	140
EE-403	Electrical Measurements and Measuring Instruments.	3	2	0	100	40	-	140
M-413	Electrical Engineering Materials	3	2	0	100	40	-	140
ECE-417	Analog Electronics-I Lab	0	0	2	-	-	40	40
EE-406	Electrical Machines-I Lab	0	0	2	-	-	40	40
EE-407	Electrical Measurements and Measuring Instruments Lab	0	0	2/2	-	-	40	40
EE-408	Control Systems-I Lab	0	0	2/2	-	-	40	40
	<b>TOTAL</b>	<b>18</b>	<b>12</b>	<b>6</b>	<b>600</b>	<b>240</b>	<b>160</b>	<b>1000</b>

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: MTH-411**  
**TITLE: ENGINEERING MATHEMATICS - IV**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION - I

**THEORY OF COMPLEX VARIABLES:** Functions of a complex variable, Limits, Continuity, Derivative, Analytic function, Cauchy-Riemann equations, Conformal mappings, Standard Transformation, Bilinear transformation, Line integral, Cauchy's theorem, Cauchy's integral formula, Cauchy's inequality, Liouville's theorem, Taylor and Laurent series expansions, Poles and singularities, Contour integration, Residue theorem, Evaluation of Real Integrals using residue theorem, and Contour integration.

### SECTION - II

**NUMERICAL METHODS:** Definition of operators, Finite and divided difference, Newton's and Lagrange's Interpolation formulas, Numerical differentiation and Numerical integration, Trapezoidal and Simpson's one-third Rule.

Numerical Solutions of Algebraic and Transcendental Equations by Regula Falsi, Newton-Raphson and direct iterative methods, Solution of difference equations, solution of differential equations by Picard's method, Euler's method, Modified Euler's method, Taylor's method, Runge-Kutta method.

### RECOMMENDED BOOKS:

- |     |                                      |                |
|-----|--------------------------------------|----------------|
| 01. | Advance Engineering Mathematics      | Jain & Iyengar |
| 02. | Numerical Methods in Engg. & Science | B.S. Grewal    |
| 03. | Difference Calculus (New Edition)    | S.C. Sexena    |
| 04. | Engineering Mathematics              | S.S. Sastri    |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-401**  
**TITLE: ELECTRICAL MACHINES-I**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Electromagnetic Energy Conversion:** Basic Principle, Energy in magnetic system, Field energy and mechanical force.

**Transformers:** Principle, Construction and operation of single phase transformer, phasor diagram, equivalent circuit, voltage regulation. Transformers losses and efficiency, Testing-Polarity Test, Open & short circuit tests, Sumpner's test.

**Three Phase Transformer:** Construction, various types of connection and their comparative features. Parallel operation of single phase and three phase transformers. Rating of transformers.

**Autotransformers:** Construction, Principle, Applications and Comparison with two winding transformer.

Scott connection, Open delta. Cooling of transformers.

### SECTION-II

**D.C. Machines:** Working principle, construction and methods of excitation.

**Armature Windings:** Study of simple lap and wave winding.

**D.C. Generators:** Emf equation, Armature reaction, Commutation- Causes of bad commutation, Methods of improvement, Effect of brush shift, Compensating winding, Characteristics of various types of generators, applications.

**D.C. Motors:** Torque equation, Characteristics of d. c. shunt, Series and compound motors, applications.

**Starting & Speed Control:** Starting methods and speed control of d. c. shunt and series motors.

**Testing:** Direct and regenerative methods to test d. c. machines.

### RECOMMENDED BOOKS:

- |  |                   |
|--|-------------------|
| 1. Performance and design of Direct Current machines     | A.E Clayton       |
| 2. Electric machinery and Transformers                   | Irving and Kosow. |
| 3. An Introduction to Electrical machines & Transformers | George Mcpersion  |
| 4. Electric machines                                     | Nagrath & Kothari |
| 5. Electrical Machinery                                  | PS Bimbhra        |
| 6. Electrical machines                                   | SK Bhattacharya   |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: ECE-416**  
**TITLE: ANALOG ELECTRONICS-I**  
**DURATION OF EXAM: 3 HOURS.**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**SEMICONDUCTOR DIODES AND CIRCUITS:** Introduction to pn junction diodes, Equivalent circuit & symbol, pn junction as rectifier, Short circuit & open circuit pn junction diodes, Current components in pn junction diode & law of junction, Volt ampere characteristics, Zener diode and Zener as shunt regulator & its analysis, LED. Half wave, Full wave & bridge rectifiers with necessary derivations, Capacitor filter, Inductor filter, LC filter with necessary derivations for ripple factor. Pulse circuits: RC integrator and differentiator circuits, diode clammers and clippers, Clipping at two dependent levels.

**BIPOLAR JUNCTION TRANSISTORS:** Transistor basics (unbiased & biased transistor), Generalized transistor equation, Transistor current components, Early effect, Transistor configurations & characteristics, Reach through & avalanche phenomena. Need for Biasing, Type of biasing circuits with necessary derivations (Fixed & Voltage Divider Biasing Circuits), Load line concept (AC & DC), Bias stabilization (S, S' S")

**AND FIELD EFFECT TRANSISTORS:** Construction of JFET, Operation, Symbol, JFET-Characteristics, JFET Parameters and their relationship, Biasing of FET, with necessary derivations. Comparison between JFET and BJT & MOSFET, FET small signal model, MOSFET (Depletion & Enhancement), Characteristics and Operation.

### SECTION – II

**SINGLE & MULTISTAGE AMPLIFIERS:** Two port network, hybrid model for CE configuration with necessary derivations, Analysis of transistor CE amplifier with & without emitter resistance using h-parameters. Need for cascading, N-stage cascaded amplifiers, Gains in decibels, Methods of coupling multistage amplifiers (RC, DC and transformer coupling), RC Coupled Amplifier and its frequency response, Effect of emitter & bypass capacitors on the bandwidth of a cascaded amplifier.

**VOLTAGE REGULATORS:** Necessity of voltage regulator, Difference between unregulated & regulated power supply, Factor affecting unregulated power supply, Stabilization, Type of voltage regulators-series voltage regulator using emitter follower, Pre-regulator, protection-simple & fold back current limiting, IC regulators (78XX,79XX,LM317,LM337) and design Problems.

#### RECOMMENDED BOOKS:

- |   |                 |
|---|-----------------|
| 1. Integrated Electronics               | Millman Halkias |
| 2. Electronics Devices                  | Bolystead       |
| 3. Electronics Devices                  | Malvino Leach   |
| 4. Pulse, Digital & Switching Waveforms | Millman & Taub  |
| 5. Pulse Circuits                       | D.A. Bell       |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-402**  
**TITLE: CONTROL SYSTEMS-1**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Introduction to Linear Control System:** Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems.

**System Representation:** Block diagrams, representation of control systems, transfer functions, signal flow graphs, polar and Bode plot representation of loop gains of control systems.

**Time Domain Analysis of Control Systems:** Time domain analysis of first & 2<sup>nd</sup> order Control systems. Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response).

**Design of Feedback Control Systems:** Approaches to system design, phase lead, and phase lag design using Bode-diagram and root locus techniques. Introduction to P,PI and PID controllers Polar Plot.

### SECTION-II

**Analysis of Linear Feedback Systems :** Stability characteristic equation, stability of linear time invariant systems, Routh-Hurwitz stability Criterion, Root locus plot, Bode plot, Polar Plot, Niquist Criterion.

**Frequency Domain Analysis of Control Systems:** Frequency domain characteristics second order systems relative stability, graphic methods of determining gain margin and phase margin, Nicholas chart.

**Control Components:** General block diagram of a control system, a.c. and d.c. Servomotors, a.c. tachometer, synchro transmitter and receiver, synchro pair as control transformer, a.c and d.c position control system, stepper motor. magnetic amplifier.

#### RECOMMENDED BOOKS:

- |                               |                   |
|-------------------------------|-------------------|
| 1. Modern Control Engineering | K.Ogatta          |
| 2. Automatic Control Systems  | B.C. Kuo          |
| 3. Control System Engineering | Nagrath and Gopal |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator and semi log graph are allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-403**  
**TITLE: ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**MEASUREMENT OF RESISTANCE:** Measurement of low resistance: - Potentiometer method, Kelvin double bridge.

**Measurement of medium resistance:** Ammeter-voltmeter method, Substitution method, Wheatstone bridge, applications of Wheatstone bridge.

**Measurement of high resistance:** Loss of charge method, Meggar method.

**GLAVANOMETERS: D'Arsonval Galvanometer:** Construction, working principle, equation of motion, critical resistance.

**A.C. BRIDGES: Measurement of Inductance using:** Maxwell's Inductance-Capacitance bridge, Anderson's bridge Campbell's bridge, Measurement of Capacitance using De-Sauty's bridge, Schering bridge Measurement of Frequency using Wein's bridge.

**POTENTIOMETERS: DC Potentiometers:** Crompton's Potentiometer, Vernier Potentiometer, uses of DC Potentiometers. A.C Potentiometers: Drysdale polar Potentiometer, uses of AC Potentiometers.

### SECTION-II

**MEASURING INSTRUMENTS:** Classification, effects utilized in measuring instruments.

**Indicating instruments:-** Deflection, controlling and damping forces, various dampings.

**Ammeters and Voltmeters:** Moving coil, moving iron and electro-dynamics type ammeter and voltmeters, electrostatic voltmeter, Errors in Ammeters and Voltmeters.

**Extension of instrument range:** Ammeter shunts, Voltmeter multipliers, C.T & P.T.

**MEASUREMENT OF POWER:** Wattmeter measurement in single phase A.C. circuits, Wattmeter errors. Measurement of three phase power by three wattmeter, two wattmeter, and one wattmeter method.

**MEASUREMENT OF ENERGY:** Energy meters for A.C. circuits, Theory of Induction type meters. Single phase Induction type Watt-hour meters, construction, theory and operation.

#### RECOMMENDED BOOKS :

1. Electrical Measurements and measuring instruments Golding Widdis.
2. A course in Electrical and Electronics Measurement & instrumentation A.K. Sawhney.

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: M-413**  
**TITLE: ELECTRICAL ENGINEERING MATERIALS**  
**DURATION OF EXAM: 3 HOURS**

Hours/Week			Marks Distribution	
L	T	P	Theory	Practical
3	2	0	100	40

### UNIT-1

Classification of Engineering materials (with special reference to Electrical and Electronics engineering materials), Engineering requirements of materials.

**Crystal structure**-- space lattice, Bravais lattice, Miller indices of cubic and hexagonal systems, closed-packed plane and directions, Packing in solids, voids, diamond cubic structure, packing in conic solids, crystal imperfections, point defect, line defect, surface defects (in brief).

### UNIT-2

Solid solutions, Hume-Rothery rule, phase diagrams, binary phase diagrams, Fe-C phase diagrams, Alloys, alloys transformations, properties of various alloys, applications of Iron –silicon, Iron-nickel and Iron-cobalt alloys, heat treatment processes- annealing, normalizing, hardening, case-hardening etc.

### UNIT-3

**Conductors**- Free electron theory, equation of conductivity, conducting materials, material requirement for contact resistors, precision resistors, thermometers, heating elements, transmission line etc.

**Semi-conductors**—Band theory, equation for conductivity, zone theory (for explaining energy gaps), types of semi-conductors, semi-conductor materials, method of glowing, technique for producing single crystal, zone referring technique.

### UNIT-4

Magnetism, types of magnetisms, dipole moment, domains, ferrimagnetism, anti-ferromagnetism, ferrite magnets, soft and hard magnetic materials and heat treatment cycles.

Dielectric materials, polarization, types, dielectric strength, dielectric losses etc., Piezo-electric effect, ferro-electric materials, optical properties of materials.

### RECOMMENDED BOOKS :

- |    |                                  |                |
|----|----------------------------------|----------------|
| 1. | Electrical Engineering Materials | A.J. Dekker.   |
| 2. | Material Science and Engineering | V Rahghvan.    |
| 3. | Electrical Engineering Materials | P.C. Kapoor.   |
| 4. | Electrical Engineering Materials | NITTTR, Madras |

**NOTE :** There shall be total eight questions, two from each unit. Five questions have to be attempted selecting at least one question from each unit. Use of calculator is allowed.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: ECE-417**  
**TITLE: ANALOG ELECTRONICS-I LAB**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS:**

1. To study the Forward & Reverse Characteristics of the pn junction, Ge/Si diodes
2. To study the Forward & Reverse characteristics of Zener diode.
3. Steady of Half wave Rectifier.
4. Steady of Full wave / Bridge Rectifier.
5. Steady Diode as clipper and Clamper Circuits
6. To study the Input and Output characteristics of PNP/ NPN Transistor Common Emitter / Common Base configurations.
7. To study the frequency response of a BJT Amplifiers.
8. To study the characteristics of FET.
9. Determination of h parameter from transistor characteristics.
10. Design of self Bias circuits using BJT.
11. Design of self Bias circuits using FET.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-406**  
**TITLE: ELECTRICAL MACHINES LAB-I**

Hours/Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS:**

1. To study the magnetic characteristics of a D.C. Machines at various operating speeds and finds the operating point of D.C. shunt machine from the same.
2. To determine the load characteristics of a D.C. Shunt generator and find its overall efficiency.
3. To determine the Torque speed characteristics of a D.C. Shunt motor and compound motor (Short & long shunt). Also study of these using armature control and field control.
4. To study the torque/speed characteristics of a D.C. series motor using various field tapings.
5. To find the efficiency and study various losses of D.C. Machines using Hopkinson test.
6. To study a single phase transformer, its Voltage ratio and turns ratio relationship. Perform open & short circuit test to determine losses, efficiency and voltage regulation and also its various parameters.
7. To perform polarity test on single phase transformers for parallel operation and study the load sharing of two parallel operated transformers.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-407**  
**TITLE: ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS LAB.**

Hours/Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2/2	0	40

**LIST OF EXPERIMENTS:**

1. Measurement of R, L & C by using RLC bridge instruments.
2. Measurements of Resistance by using
  - a) Wheatstone bridge.
  - b) Kelvin's Double Bridge.
3. Study of various types of Multimeters.
4. Demonstration of M.C., M.I. and Dynamometer type instruments.
5. Measurement of self inductance, mutual inductance and coupling coefficient of
  - a) Transformer windings and
  - b) Air-cored coils.
6. Extension of the range of Ammeter, Voltmeter, and Wattmeter, using Shunt/series resistance and instrument transformers.
7. Calibration of single phase energy meter by
  - a) Direct loading
  - b) Phantom loading at various points.
8. Calibration of three phase energy meter using standard Wattmeter.
9. Measurement of Capacitance using Schering Bridge.
10.
  - a) Measurement of Power factor at Consumers terminals.
  - b) Measurement of Maximum KVA demand of a consumer.
  - c) Measurement of A.C. Potentials using A.C. Potentiometer.

**CLASS: B.E. 4<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-408**  
**TITLE: CONTROL SYSTEMS-I LAB.**

Hours/Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2/2	0	40

#### LIST OF EXPERIMENTS:

1. Transient response of Second order system comprising R.L&C finding therefore maximum overshoot, rise time, settling time, damping factor/ratio natural undamped frequency.
2. Frequency response of a first order and second order system comprising RC, RLC and draw the Bode plots and Nyquist Plots.
3. Transient response of a first, second and higher order Pneumatic servo system.
4. Transient response of a first, second and higher order Hydraulic system.
5. To find the torque speed, torque voltage characteristics of a servo motor and determine its transfer function.
6. Study of synchros, transmitter, receiver and control transformer. Voltage angular wave forms and zeroing.
7. To simulate a second and higher order system on an analog simulator and find its transient response to step, ramp and other input functions.
8. Study of a demonstration servo system (both open & closed) loop comprising error detector, amplifier, a motor cum load having a tacho feed back.
9. Study of phase lag and phase lead networks.

## UNIVERSITY OF JAMMU, JAMMU

**COURSE SCHEME**  
**5<sup>th</sup> SEMESTER ELECTRICAL ENGINEERING**  
**FOR EXAMINATION TO BE HELD FOR THE BATCH 2014 AND ONWARDS**

Course		Hours/Week			Marks			
Course Code	Title	L	T	P	Theory	Sessional	Practical	Total
EE-501	Electrical Machines-II	3	2	-	100	40	-	140
EE-502	Electrical Machine Design-I	3	2	-	100	40	-	140
ECE-507	Analog Electronics-II	3	2	-	100	40	-	140
ECE-503	Digital Electronics	3	2	-	100	40	-	140
ECE-509	Communication Engineering	3	2	-	100	40	-	140
C-511	Hydraulics & Hydraulic Machines	3	2	-	100	40	-	140
EE-503	Electrical machine-II Lab.	-	-	2/2	-	-	40	40
ECE-516	Analog Electronics-II Lab.	-	-	2	-	-	40	40
ECE-512	Digital Electronics Lab	-	-	2	-	-	40	40
ECE-515	Communication Engineering Lab	-	-	2/2	-	-	40	40
<b>Total</b>		<b>18</b>	<b>12</b>	<b>6</b>	<b>600</b>	<b>240</b>	<b>160</b>	<b>1000</b>

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-501**  
**TITLE: ELECTRICAL MACHINES-II**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Induction Machines:** Constructional features, principle of operation, Rotor e.m.f., current power, frequency, equivalent circuit, Phasor diagram of induction motor, Losses and efficiency. Torque-Slip characteristics.

**Testing of Induction Motor:** No load test and blocked rotor test.

Starting, cogging and crawling, Speed control of Induction motors. Applications

**Single Phase Induction Motors:** Constructional features, Principle of working: cross-field theory and double revolving field theory, equivalent circuit, determination of parameters, starting methods & applications.

### SECTION-II

**Synchronous Machines:** Constructional features, Cylindrical rotor machine- Synchronous Generators- Generated e.m.f., phasor diagram, armature reaction, Voltage regulation: synchronous impedance, M.M.F. and Zero power factor method. Hunting, Synchronous Condenser.

**Synchronous Motor:** Operating principle, phasor diagram, operating characteristics of synchronous machines, V-curves, starting methods of synchronous motors.

**Salient pole Machine:** Two reaction theory, analysis of phasor diagram, power angle characteristics, determination of  $X_d$  and  $X_q$ .

**Parallel operation of Alternators-** Synchronization and load division.

### RECOMMENDED BOOKS:

- |                         |                             |
|-------------------------|-----------------------------|
| 1. Electrical Machinery | Fitzgerald Umans & Kingsley |
| 2. AC Machines          | Alexander S. Langsdorf      |
| 3. Electrical machines  | Charles S. Siskind          |
| 4. Electric Machines    | Nagrath & Kothari           |
| 5. Electrical Machinery | PS Bhimbra                  |
| 6. Electrical machines  | SK Bhattacharya             |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-502**  
**TITLE: ELECTRICAL MACHINE DESIGN-1**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Design of D.C. Machines:** Output equation, Choice of average Gap Density & ampere conductors per meter, selection of number of poles.

**Armature Design:** Choice of Armature winding, No. of armature conductors, No. of armature slots, cross section of armature. Insulation of armature windings. Depth of armature core, armature voltage drop.

**Design of Field System:** Pole design, magnetic circuit, design of Shunt and series field.

**Design of Interpoles:** Time of commutation, width of commutation zone, width of interpole shoe, calculation of reactance voltage.

**Design of communication & Brushes:** Commutator length and diameter, Dimensions of brushes, losses at commutator surface.

**Losses and efficiency:** Rotational losses, I<sup>2</sup>R losses, Efficiency.

### SECTION-II

**Design of Three Phase Transformers:** - Output of transformer, Output equation, Relation between Core area and weight of Iron & Copper, Ratio of iron loss to copper loss.

**Optimum Design:** Design for minimum cost, design for minimum loss or maximum efficiency.

**Design for core:** Square & stepped core.

**Window space factor, window dimensions:** Width of window for optimum output.

Design of Yoke.

**Design of small single phase transformer:** Core design, winding design, core area.

### RECOMMENDED BOOKS:

- |   |                               |
|---|-------------------------------|
| 1. Electrical Machine Design                                  | A.K. Sawhney & A. Chakrabatti |
| 2. The performance and design of alternating current machines | M.G. Say                      |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE NO: ECE-507**  
**TITLE: ANALOG ELECTRONICS-II**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**FEEDBACK AMPLIFIERS:** Classification of amplifiers, Limitation of basic amplifier, Distortion in amplifier, need for feedback, Feedback concept, Advantages of negative feedback, Ways of introducing negative feedback in amplifiers, Gain with & without feedback, Effect of negative feedback on input, output resistance & bandwidth of the amplifiers, Their respective analysis for feedback amplifiers, Procedure for analysis of feedback amplifiers, Analysis of different Topologies.

**SINUSOIDAL OSCILLATORS:** Necessarily of oscillator, Gain with feedback, Barkhausen criteria, Types of oscillators, Collpitts, clapp, Hartley, RC phase shift oscillators with necessary derivations to determine gain required for oscillation & frequency of oscillation, Crystal oscillators.

**POWER AMPLIFIERS:** General features of power transistor, Difference between power and voltage amplifier, Need for power amplifier, Classification of power amplifiers with necessary load lines concept & derivations (Efficiency, power dissipation), Crossover distortion & its remedy, Determination of harmonic distortion, Single ended, & push-pull amplifiers.

### SECTION-II

**OPERATIONAL AMPLIFIERS AND APPLICATIONS:** Operational amplifiers, Block diagram characteristics of ideal & practical operational amp, Inverting & non-inverting amplifier configuration, DC & AC Amplifier, AC amplifier with single power supply, Applications of Op-amp as Summing & difference amplifier, Voltage follower, Differential amplifiers using one and two Op-amp, Differentiator, Integrator, Active filters, comparator, zero crossing detector, Schmitt trigger, Square wave generator, Triangular wave generator. Digital to Analog (D/A) Converter, Binary Weighted Resistor, R-2R Resistor type D/A Converters, A/D Converters & its types-successive approximation type A/D Converter.

### RECOMMENDED BOOKS:

- |                                   |                          |
|-----------------------------------|--------------------------|
| 1. Integrated Electronics         | J.Millman & C.C. Halkias |
| 2. Electronics Devices & Circuits | Millman & Halkias        |
| 3. Electronics Devices & Circuits | Robert Bolysted          |
| 4. Op-Amp. & Linear IC,s          | Ramakant & Gayakwad      |
| 5. Design with Op-Amp.            | Franco                   |
| 6. Microelectronics               | Sedra & Smith            |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ECE / EE**  
**COURSE CODE: ECE-503**  
**TITLE: DIGITAL ELECTRONICS**  
**DURATION OF EXAM.: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

Number System, Radix conversion, Arithmetic with base other than ten, Data representation – fixed & floating points, Binary codes – weighted/Non weighted codes, Error detecting & correcting code (Hamming code), Alphanumeric code, Subtraction of signed/unsigned number.

Logic Gates, Boolean algebra, Simplification of Boolean expressions, Minimization techniques, Karnaugh map (up to five variables), Simplification of Logic families – RTL, DTL, TTL, ECE & MOS families and their characteristics.

### SECTION-II

**Combinational logic circuits:** Half and Full adders, Subtractors, BCD Adder, Comparators, Multiplexer, Realization of function using MUX, Demultiplexer, Decoder, Encoder, Code converters, General problems, PLA, Design of combinational circuit using PLA & PAL.

Introduction to sequential logic circuits, Synchronous and Asynchronous operation, Flip-Flops – R-S, J-K, D, T & Master-Slave flip-flop, Conversion of flip-flops, Shift registers, Analysis of asynchronous & synchronous sequential counter, Design of sequential logic circuits, Problem formulations, State minimization techniques.

### RECOMMENDED BOOKS :

- |     |                                     |                        |
|-----|-------------------------------------|------------------------|
| 01. | Digital Electronics                 | R.P Jain               |
| 02. | Digital Electronics & Microcomputer | R.K. Gaur              |
| 03. | Computer System Architecture        | M.M. Mano              |
| 04. | Digital Electronics                 | Jamini & K.M. Backward |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: ECE-509**  
**TITLE: COMMUNICATION ENGINEERING**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Introduction to Elect. Comm. System,** Concept & need for modulation, Definition of signal to noise ratio & noise figure, Representation of signal & system (periodic non-periodic etc.), Spectral analysis of signal (Fourier series & Fourier Transforms), Representation of AM. Frequency spectrum of AM wave, Power relation in AM wave, Modulation & demodulation of AM, SSB techniques, Balanced modulator, Type of SSB, Modulation & demodulation of SSB signals.

Theory of FM, Representation & frequency spectrum of FM, Pre-Emphasis, De-Emphasis, Wide band & narrow band FM, Generation & detection of FM signal, Comparison with PM & AM.

### SECTION-II

Pulse modulation techniques, Sampling & sampling theorem, Natural & flat top sampling principle generation & detection of PAM, PWM, PCM, DM, ADM, Time division multiplexing, Frequency division multiplexing, Introduction of Digital Modulation Techniques.

**Information Theory:** Information rate, Entropy, Source-coding & coding Efficiency, Shannon-Fano coding, Huff-man coding, Channel capacity theorem.

**NOTE :** There will be eight questions of 20 marks each, four from each section. Five questions are to be attempted selecting at least two questions from each section.

### RECOMMENDED BOOKS :

01. Electronics Comm. System            G. Kennedy  
02. Principles of Comm. System        Taub & Schilling

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**

**BRANCH: ELECTRICAL ENGINEERING**

**COURSE CODE: C-511**

**TITLE: HYDRAULIC AND HYDRAULIC MACHINES**

**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Properties of fluids:** Mass density, Specific weight, Specific volume, Viscosity, bulk modulus of elasticity, Surface tension and capillarity.

Pressure exerted by liquids, hydrostatic pressure on immersed bodies, simple manometers, kinematics of flow, Bernoulli's theorem, flow measuring devices like venturimeter, Pilot tube orifice plate. Discharge measurement- flow through orifice and mouthpiece, coefficients of discharge and velocity.

Flow through pipes, hydraulic gradient, Darcy-Weisbach formula, equivalent diameter of pipes, transmission of power through pipes, two- reservoir and three reservoir problem etc.

Flow through open channels, chezy's and Manning's formulae, design of economic section etc.

### SECTION-II

Impact of jets on flat and curved surfaces, impact of jets on fixed and moving vanes, velocity triangles, work done and efficiency.

Turbines- their types, unit quantities, specific speed, work done, power & efficiency, selection of turbines, penstocks. Dimensional analysis, principles of similarity, models & prototypes.

Typical turbine installation, layout of power house, pumps-types, working of centrifugal pump, selection of pumps.

**RECOMMENDED BOOKS :**

- |   |                                     |
|---|-------------------------------------|
| 1. Fluid Mechanics                          | Victor L. Streeter & Benjamin Wylie |
| 2. Engineering fluid mechanics              | R.J. Garde & A.C. Mirajgaoker       |
| 3. Theory of application to fluid mechanics | K. Subramaniam                      |
| 4. Fluid Mechanics                          | Shames.                             |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-503**  
**TITLE: ELECTRICAL MACHINES-II LAB**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2/2	0	40

**LIST OF EXPERIMENTS :****UNIT-I : Synchronous Machines:**

1. Determination of voltage regulation of a 3-phase synchronous generator/alternator by E.M.F., M.M.F. & A.S.A. method (Non-Salient Pole type).
2. Determination of positive, negative and zero sequence reactance's of 3-phase synchronous machine.
3. Determination of V curves of a 3- phase synchronous Motor.
4. Power Angle characteristics of a 3-phase synchronous machine.
5. Determination of various direct and quadrature Axis reactance's of an Alternator.
6. Study of parallel operation & synchronization of 3-phase synchronous generators.

**UNIT-II : Induction Machines :**

7. Determination of operating characteristics of a single phase induction motor.
8. Speed control of 3-phase Induction motor by varying supply frequency & of 3-phase slip Ring Induction motor by Rotor Impedance Control.
9. Determination of complete Torque/Slip or Torque/Speed characteristics of a 3-phase Induction-motor.
10. To study the Torque/Sped, Voltage/Speed, characteristics of a single phase repulsion motor & universal motor.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: ECE-516**  
**TITLE: ANALOG ELECTRONICS-II LAB**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS:**

1. Determination of voltage gain, Input and output resistance of feedback amplifier. Steady the voltage gain of the Amplifier with and without feedback.
2. Determination of Distortion, output power of push pull class-B Amplifier.
3. Study of single ended class-A power amplifier & determine its output power & efficiency.
4. Study of complimentary symmetry pushpull amplifier.
5. Design & determination of stability factor series of zener shunt Regulator / IC Regulator.
6. Design of Shunt and Series regulators using BJT.
7. Study of sinusoidal Oscillators Colpitt, Clapp, Hartley, Wein bridge, Phase shift oscillator & Determine the frequency of output waveforms.
8. Study of Op-amp applications as Adder, Subtractor, Differentiator, Integrator, Differential Amp, Comparator, Inverter, Non-Inverting amplifier, Square wave generator.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ECE / EE**  
**COURSE CODE: ECE-512**  
**TITLE: DIGITAL ELECTRONICS LAB.**  
**DURATION OF EXAM.: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS:**

01. Verification of truth tables of logical gates AND / OR / NOT, NAND, NOR, EXOR, EXNOR, gates.
02. Implementation of Boolean expression using AND, OR, NOT, NAND, & NOR logic.
03. Implementation of Decoder, Encoder using IC's & gates.
04. To implement half adder, half subtractor, full adder, full subtractor using different IC's & gates.
05. Implementation of multiplexer, Demultiplexer using IC's & gates.
06. Design of BCD to seven segment display using logical gates & IC's.
07. To design & verification of truth table of SR, JK, MS-JK Flip Flops.
08. To design various asynchronous counters using flip flops, gates & IC's.
09. To design various synchronous counters using flip flops, gates & IC's.
10. To design & Verify the Truth tables of shift Registers.

**CLASS: B.E. 5<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: ECE-515**  
**TITLE: COMMUNICATION ENGG. LAB.**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2/2	0	40

**List of Experiments:**

01. To plot the response of RF Tuned Amp.
02. To find the modulation under of AM signal
03. Hardware realization of AM demodulation circuit
04. Hardware realization of FM modulation circuit using IC 8038
05. To plot the response of IF transformer
06. Hardware realization of sample & hold circuit
07. Hardware realization of ASK modulation
08. Study of PCM signal

## UNIVERSITY OF JAMMU

## COURSE SCHEME

**B.E. 6<sup>th</sup> SEMESTER ELECTRICAL ENGINEERING  
FOR EXAMINATION TO BE HELD FOR THE BATCH 2014 AND ONWARDS**

Course		Hours/Week			Marks			
Course Code	Title	L	T	P	Theory	Sessional	Practical	Total
HUM-601	Organizational Behaviour	3	2	0	100	40	-	140
EE-602	Power System-I	3	2	0	100	50	-	150
EE-603	Power Electronics	3	2	0	100	40	-	140
EE-604	Control Systems-II	3	2	0	100	40	-	140
ECE-601	Microprocessor(8085) and Peripheral Interfacing	3	2	0	100	40	-	140
EE-605	Electrical Machine Design -II	3	2	0	100	50	-	150
EE-606	Power Electronics Lab	-	-	2	-	-	40	40
ECE-606	Microprocessor(8085) and Peripheral Interfacing Lab	-	-	2	-	-	40	40
EE-607	Power System-I Lab.	-	-	2	-	-	60	60
	<b>Total</b>	<b>18</b>	<b>12</b>	<b>6</b>	<b>600</b>	<b>260</b>	<b>140</b>	<b>1000</b>

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: HUM-601**  
**TITLE: ORGANIZATIONAL BEHAVIOUR**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

**SECTION-I**

**BASIC CONCEPT OF ORGANIZATIONAL BEHAVIOR**

- 1) Individual Difference: Meaning, Factors & implications of individual difference
- 2) Motivation: Concept & importance  
Theories of motivation: Maslow’s need hierarchy  
Herzberg’s motivation hygiene theory  
McClelland’s need theory
- 3) Personality: Concept & determinants of personality
- 4) Perception attitude: Meaning, definition, perceptual process, internal and external factors in perceptual selectivity

**MANPOWER PLANNING**

- 1) Manpower planning: Definition, objectives, importance, steps & factors affecting manpower planning.
- 2) Recruitment & selection process : Meaning, sources, scientific selection, selection procedure
- 3) Training & placement: Need, importance, methods

**SECTION-II**

**ORGANISATION DYNAMICS:**

- 1) Organisation: Meaning, definition, need & principles, formal & informal organization
- 2) Organisation structure: Line, Line & staff, functional organizational structure
- 3) Authority: Concept, kinds, sources, limits
- 4) Power: Importance, sources, traits, bases
- 5) Organisational change: Meaning, forces, resistance to change, measures of overcoming resistance to change
- 6) ORGANISATIONAL CONFLICT:  
CONCEPT, SOURCES, CONFLICT RESOLUTION MANAGEMENT:
- 1) Organisation & environment interface: Introduction, nature of environment---- General & Task environment, Environment uncertainty, strategies to deal with environment
- 2) Scientific management: Meaning, principles, advantages & criticism
- 3) Fatigue: Causes & ways of eradicating fatigue
- 4) Accidents: Causes of accidents & accident prevention

**RECOMMENDED BOOKS:**

Organizational behaviour ( Humane behaviour at work)	Keith Davis
Organisational theory & behavior	B.P. Singh I
Organisational Behaviour	T.N. Chhabra, Parag
Organisational Behaviour	L.M. Parsad

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-602**  
**TITLE: POWER SYSTEM-I**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION-I

**D.C. & A.C Distribution Systems:** Introduction to a Power System (an overall view). Distribution Systems- Feeder, Distribution, service mains. Classification of distribution system. Various types of D.C. and A.C. distributors, Voltage drop calculations.

**Overhead AC Transmission Lines Parameters:** Types of conductors, bundling of conductors, Resistance calculations, skin effect, proximity effect. Inductance and Capacitance of single phase, 3-phase, single circuit and double circuit lines.

**Interference of Power Lines with Communication Lines:** Electrostatic and electromagnetic effects.

### SECTION-II

**Performance Of Transmission Lines:** Representation and performance of short, medium and long lines. A,B,C,D constants, surge impedance, Ferranti effect.

**Insulators for Overhead Lines:** Materials for insulators, types of insulators, potential distribution over a string of suspension insulators, methods for equalizing the potential.

**Corona:** Visual and critical disruptive voltage conditions effecting corona, power loss due to corona, practical considerations.

Mechanical Design of transmission line

Calculation of sag and tension, equivalent span length and sag, effect of ice and wind loading, conductor vibrations and vibration dampers

### RECOMMENDED BOOKS:

- |   |                         |
|---|-------------------------|
| 1. Elements of power System Analysis                | C.W. Stevenson          |
| 2. Transmission and distribution of Electric Energy | H. Cotton and H. Barber |
| 3. Electric Power System                            | C.L. Wadhwa             |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: EE/ECE ENGINEERING**  
**COURSE CODE: EE-603**  
**TITLE: POWER ELECTRONICS**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

Concept of Power Electronics, Applications, Advantages and disadvantages. Power electronic system and devices.

Solid state devices: SCR: Basic theory of operation, characteristics: Static and Dynamic, SCR ratings, Protection of SCR against over current, over voltage high  $dV/dt$ ,  $de/dt$ . Snubber circuit, series and Parallel operation of SCR. Gate protection. Firing circuits of SCR. SCR gate characteristics, Two-transistor analogy of SCR. Thyristor family: SCR, TRIAC, DIAC, GTO, PUT, LASCR

Classification of Rectifiers, Phase Controlled rectifiers: Single phase and three phase, half wave and full wave fully controlled and half controlled rectifiers with R, L, E loads with and without free wheeling diodes.

### SECTION-II

Methods of commutation.

AC phase control: Operation of Single phase, Half and full wave AC controller with R, R-L Load, Integral cycle control, sequence control.

Choppers: Principles and basic ckt. Operation, classification, steady state analysis, Control strategies. Commutation in chopper circuits.

Inverters: Single phase voltage source Inverters, Voltage control of single phase inverters.

Cycloconverters: Classification, single phase to single phase cycloconverters with resistive inductive load.

### RECOMMENDED BOOKS:

- |   |                              |
|---|------------------------------|
| 1. Power Electronics                                      | PS Bhimbra,                  |
| 2. Power Electronics                                      | MD Singh and KB Khanchandani |
| 3. Power Electronics                                      | AF Gupta and LP Singh        |
| 4. Fundamental of Power Electronics                       | Rama Reddy                   |
| 5. Power Electronics Converters,<br>Applications & Design | Mohan, Undeland and Robbins  |
| 6. Advanced Power Electronics                             | B.K.Bose                     |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-604**  
**TITLE: CONTROL SYSTEMS-II**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**State Space Analysis of continuous System:** Concept of state, state variable and state space representation. Block diagrams, transfer function and signal flow graphs in the state space. Review of state variable representation of continuous system, conversion of state variable models to transfer function and vice versa, solution of state equations and state transition matrix, controllability and observability, design of state observer and controller.

**Stability:** Lyapunov's stability theorems for continuous and discrete systems, methods for generating Lyapunov function for continuous and discrete system, Popov's criterion.

**Analysis of Discrete System:** Discrete system and discrete time signals, state variable model and transfer model of discrete system, conversion of state variable model to transfer function model and vice versa, modeling of sample hold circuit, solution of state different equations, steady state accuracy, stability on the z-plane and Jury stability criterion, bilinear transformation.

### SECTION-II

**Non-Linear Systems:** Types of non linearities, phenomena related to non-linear systems. Analysis of non-linear systems- Linearization method, second order non-linear system on the phase plane, types of phase portraits, singular points, system analysis by phase-plane method, describing function and its application to system analysis.

**Adaptive Control:** Introduction, modal reference adaptive control systems, controller structure, self tuning regulators.

Introduction to neural network, fuzzy logic and genetic algorithms.

### RECOMMENDED BOOKS:

- |  |  |
|--|--|
| 1. Digital Control and State variable methods                                      | M. Gopal                                 |
| 2. Introduction to Control Engineering : Modeling, Analysis and Design             | Ajit K. Mandal                           |
| 3. Adaptive Control  | D. Landau                                |
| 4. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications | S. Rajasekaran & G.A. Vijayalakshmi Pai. |
| 5. Optimal Control Theory: An introduction   | Donalnd E. Kiv                           |
| 6. Digital Control Systems   | B. C. Kuo                                |
| 7. Digital Control Systems: Theory, Hardware, Software                             | C.H. Houpis and G.B. Lamont              |
| 8. Feedback control of dynamic systems   | Franklin & Powel                         |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER****BRANCH: ECE / EE / AEI****COURSE NO.: ECE-601****COURSE TITLE: MICROPROCESSOR (8085) & PERIPHERAL INTERFACING****DURATION OF EXAM: 3 Hours**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
3	2	0	100	40

**SECTION-I**

1. Microprocessor 8085 pin diagram, Architecture, Addressing modes, Instruction set, Instruction format, Timing diagram, Programming techniques with additional instructions, looping, Counting design of counters & time delays, debugging & memory mapping.
2. Stack & Subroutines, Advanced subroutines concept, Call & Ret instructions, Advanced programming (Code conversions, BCD addition/subtraction, Multiplication etc), 8085 interrupts & process....

**SECTION-II**

1. Interfacing I/O devices, Basic interfacing concept, Interfacing with scanned multiplexed displays & LCD's, Interfacing output displays, Interfacing i/p devices, Memory mapped i/o design, Memory wait states & access time.
2. Serial I/O data communication, Basic concepts in serial I/O, 8085 serial I/O lines – SID & SOD, Synchronous & asynchronous data communication, Software controlled asynchronous serial I/O.
3. Interfacing to 8085 Microprocessor: PPI – 8155 I/O & timer, PPI – 8255 (mode-0, 1, 2 & BSR), PID 8279 keyboard/display interface, PIC 8259, DMA controller 8257/8237.

**RECOMMENDED BOOKS:**

- |     |  |                  |
|-----|--|------------------|
| 01. | Microprocessor Architecture Programming & App. | Ramesh Gaonkar   |
| 02. | Introduction to Microprocessor                 | Aditya P. Mathur |
| 03. | The Intel Microprocessor                       | Brey             |
| 04. | Fundamental of Microprocessor & Microcomputers | B. Ram           |
| 05. | Microprocessor and Interfacing                 | D.V. Hall        |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-605**  
**TITLE: ELECTRICAL MACHINE DESIGN-II**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION- I

**Design of 3-phase Induction Motors:** Output equation, choice of average flux density in air gap and Ampere conductors per meter, Main dimensions.

**Stator Winding:** Turn per phase and stator conductors. Shape, Number and area of stator slots. Stator core and teeth.

**Rotor Design:** Length of air gap, Rotor teeth and rotor core.

Losses and Efficiency.

**Design of Single-Phase Induction Motors:** Output equations, Choice of specific loading, Main dimensions, Number and size of stator slots, Stator teeth and core.

**Design of Rotor:** No. of rotor slots, area of rotor bars, area of end rings, rotor resistance, teeth and core.

### SECTION-II

**Synchronous Machines:** Output equation, Choice of specific Electric & Magnetic Loading.

Design of Salient Pole Machine: Main dimensions, Length of air gap.

**Armature Design:** No. of armatures slots, coil span, Turns per phase, conductor section, Slot Dimension, Length of mean turn, Depth of core, Estimation of air gap length.

**Design of Rotor:** Height of pole and pole shoe, Design of damper windings.

**Magnetic Circuit:** MMF for air gap, armature teeth, core poles and yoke.

Design of field windings and losses.

### RECOMMENDED BOOKS:

- |   |                                |
|---|--------------------------------|
| 1. Electrical Machine Design                                  | A.K. Sawhney & A. Chakrabatti. |
| 2. The performance and design of alternating current machines | M.G. Say                       |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: EE/ECE**  
**COURSE CODE: EE-606**  
**TITLE: POWER ELECTRONICS LAB**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS:**

1. SCR Triggering circuits.
2. Forced Commutation Circuits in Converters.
3. SCR Phase Control Circuits.
4. Triac Phase Control Circuits.
5. Fully Controlled Single - Phase thyristor bridge.
6. SCR DC Circuit breaker.
7. Zero Voltage switching.
8. Voltage Commutated DC chopper.
9. Current commutated DC chopper.
10. Microprocessor based three – phase thyristor bridge.
11. Series connected single – phase converters.
12. Series inverters.
13. Converter fed drive.
14. Chopper fed drive.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: ECE/EE/AEI**  
**COURSE CODE: ECE-606**  
**TITLE: MICROPROCESSOR (8085) & PERIPHERAL INTERFACING LAB.**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS:**

01. Programs of data transfer group and block transfer of data from Source memory to destination memory.
02. Programs on Arithmetic, Logical group of instruction, Multiplication of two unsigned 8 bit number & factorial of a number.
03. Programs on time delay & counters.
04. Advanced programming such as binary to ASCII, Vice versa & BCD addition.
05. Study of 8255-PPI interfacing card, 8257-DMA controller interfacing card, 8259-PIC interfacing card, 8253-Timer & counter interfacing card.

**CLASS: B.E. 6<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-607**  
**TITLE: POWER SYSTEM-I LAB**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	60

**LIST OF EXPERIMENTS:**

1. Performance Characteristics of a Short Transmission Line.
2. Performance Characteristics of a Medium Power Transmission Line.
3. Performance Characteristics of a long Power Transmission Line.
4. Study of all types of Overhead Line Conductors.
5. Study of all types of Overhead Line Insulators.
6. Study of Corona formation of High Voltage Overhead Lines.

## UNIVERSITY OF JAMMU, JAMMU

**COURSE SCHEME**  
**7<sup>th</sup> SEMESTER ELECTRICAL ENGINEERING**  
**FOR EXAMINATION TO BE HELD FOR THE BATCH 2014 AND ONWARDS**

Course		Hours / Week			Marks			
Course Code	Title	L	T	P	Theory	Sessional	Practical	Total
EE-701	Switchgear & Protection	3	2	--	100	40	--	140
EE-702	Power System-II	3	2	--	100	40	--	140
EE-703	Electronic Measurements & Instrumentation	3	2	--	100	40	--	140
Elective-I EE-704	Advanced Electrical Machines Power Station Practice Energy Auditing	3	2	--	100	40	--	140
EE-705	Minor Project	--	2	4	--	--	150	150
EE-706	Seminar	--	--	4	--	--	100	100
EE-707	Industrial Training	--	--	--	--	--	50	50
EE-708	Switch Gear & Protection Lab.	--	--	2	--	--	50	50
EE-709	Power System-II Lab.	--	--	2	--	--	50	50
EE-710	Electronic Measurements & Instrumentation Lab.	--	--	2	--	--	40	40
<b>Total</b>		<b>12</b>	<b>10</b>	<b>14</b>	<b>400</b>	<b>160</b>	<b>440</b>	<b>1000</b>

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-701**  
**TITLE: SWITCHGEAR AND PROTECTION**  
**DURATION OF EXAM: 3 HOURS.**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

Switching Surges, traveling waves, surge impedance, open and short-circuited lines, reflected and transmitted waves.

Relay principles and types, general equations for relays, phase and amplitude comparator, static over current, directional and distance relays, carrier current protection, protection of transformers, Alternators, bus bars and lines.

### SECTION-II

**Circuit breaker:** principle of arc interruption, recovery and restriking voltage, RRRV, current chopping, Bulk and minimum oil CB, Vacuum interrupters, rating and testing of CBs, HRC fuses.

Causes of over voltages, over voltage protection, ground wires, protection against surges, surge absorbers, rating of lightning arresters.

Neutral grounding, effectively grounded system, resonant grounding.

#### RECOMMENDED BOOKS:

- |                                 |                        |
|---------------------------------|------------------------|
| 1. A Course in Electrical Power | Soni Gupta & Bhatnagar |
| 2. Electric Power System        | C.L. Wadhwa            |
| 3. Travelling Waves             | Bewley                 |
| 4. Power System Engg.           | Nagrath & Kothari      |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-702**  
**TITLE: POWER SYSTEM-II**  
**DURATION OF EXAM: 3 HOURS.**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Underground Cables:** Construction of cable, insulating materials, types of cables-Mass impregnated, oil filled and gas filled paper cables, Solid dielectric cables, Gas filled cables, super conducting cables. Electrostatic stresses in a cable, grading of cables, insulation resistance of cables, capacitance of single core and three core cables, heating of cables, current carrying capacity of a cable.

Symmetrical Components and their Applications to Unsymmetrical Fault Analysis: Symmetrical components, sequence impedance's, Sequence networks, unsymmetrical faults: single line to ground , line-to-line , double line ground faults on unloaded alternator and on power system, 3-phase short circuits, short circuits capacity of a bus, selection of circuit breakers.

**SECTION-II**

**Per Unit Representation of a Power System:** Single line diagram, impedance and reactance diagram of a power system, per unit system of calculations, per unit representation of a power system.

**Insulation Co-ordination:** Generation of over voltages in power system, resonance over voltages, switching over voltages, lightning over voltages, lightning phenomenon, protection of power system against over voltages, ground wires, lightning arrestors, concept of insulation coordination, basic impulse insulation level, standard impulse test wave, volt- time curve, location and ratings of lightning arrestors.

Introduction to H.V.D.C. Transmission lines.

**RECOMMENDED BOOKS:**

1. Elements of Power System Analysis W.D. Stevenson
2. Electrical Power System C.L. Wadhwa
3. Power System Engg Nagrath & Kothari
4. Power System Analysis B.R. Gupta

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**BRANCH: ELECTRICAL ENGINEERING**

**COURSE CODE: EE-703**

**TITLE: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**

**DURATION OF EXAM: 3 HOURS.**

**Hours/ Week**

**Marks Distribution**

L	T	P	Theory	Sessional
3	2	0	100	40

**SECTION-I**

**Magnetic Measurement:** A.C. and D.C.: Determination of hysteresis, loop permeability and Iron loss measurements, separation of losses. Ferromagnetic properties.

**Signal Analysers:** Introduction, Wave Analysers- Frequency selective wave analyzer, Heterodyne wave Analyser, Distortion Analysers. Spectrum Analyser- Basic Spectrum analyzer, Spectral Displays, Spectra of different signals.

**Oscilloscopes:** Introduction- CRO, cathode ray tube, Block diagram of CRO, deflection amplifier and delay line, source and coupling of trigger generator, Automatic time base. Dual trace Oscilloscopes, sweep modes, Measurement of voltage, frequency & phase.

**SECTION-II**

**Phase and frequency measurements:**

**Power Factor Meters:** Single- phase and three- phase Electrodynamometer power factor meter, Moving iron power factor meters.

**Frequency meters:** Mechanical resonance type frequency meter.

**Electrical resonance type frequency meters:-** Weston type frequency meter, Ratiometer type frequency meter, Saturable core type frequency meter.

**Transducers:** Introduction, Principles of operation, Classification of transducers. Summary of factors influencing the choice of transducer, Qualitative treatment of Strain Guage, LVDT, Thermocouple, Piezo- electric crystal and photoelectric transducers.

**High Voltage Measurements:** Measurement of RMS and peak value of voltage.

**RECOMMENDED BOOKS:**

1. Electrical Measurements      Golding.
2. Electronic Measurements      Petit and Terman.
3. Electronic Instrumentation      J.A. Alloca
4. Electronic Instrumentation      B.H. Oliver & J.M. Cage.

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**

**BRANCH: ELECTRICAL ENGINEERING**

**COURSE CODE: EE-704(A), ELECTIVE-I**

**TITLE: ADVANCED ELECTRICAL MACHINES**

**DURATION OF EXAM: 3 HOURS**

**Hours/ Week**

**Marks Distribution**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

**SECTION-I**

**Commutator Machines:** Effect of injected emf in the rotor circuit of 3-phase inductor motor, slip power, constant torque and constant H.P. Drive, Kramer control, Schrage motor construction, principle of operation, characteristics and applications.

**Single-phase series motor:** torque expression plain series motor (Universal motor), phasor diagram commutation, operation on A.C. and D.C. supplies, Compensated series motor phase diagram and commutation.

**2-phase A.C. Servomotor:** Requirements for control applications: Development of equivalent Circuit: Torque-speed Characteristics and transfer function.

**SECTION-II**

**Unbalanced operation of 3-phase induction motor:** Expression for sequence impedance matrix, analysis with stator unbalance for unbalanced supply and faulty operation such as open-circuit stator phases, analysis for rotor unbalance.

**Synchronous Machine Dynamic Modeling:** Introduction, park's transformation, flux linkage, voltage and torque equations, Formation of state- space equations, transient and sub-transient inductances and time constants.

Dynamic Model of 3-phase induction motor.

**RECOMMENDED BOOKS:**

1. Performance and design of commutator machines      Openshaw Taylog Wheeler
2. Symmetrical Components      Wagen & Evans
3. Power System Control & stability      P.M. Anderson-A.A. Foud
4. Advance Electrical Machine      P.S. Bhimbra.

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-704(B), ELECTIVE-I**  
**TITLE: POWER STATION PRACTICE**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

Choice of Generating Power stations, Power Scenario of India, factors affecting the cost of generation, choice of size and number of generating units. Power factor, disadvantages of low power factor, methods of improving power factor, location of power factor improvement apparatus, economics of power factor improvement.

**Power Tariff:** Cost of generating station, fixed capital, running capital, annual cost, running charges, fixed charges, factors influencing the rate of tariff, designing tariff, different types of tariff, flat rate tariff, block rate tariff, two part tariff, maximum demand tariff, power factor tariff

Types of substations, Key diagrams.

Safety and maintenance.

### SECTION-II

Automatic Voltage regulators, Voltage control and reactive power requirements

Frequency Control.

Power Plant Instrumentation, major electrical equipments in power stations.

Commissioning and operation of alternators control of unit emergency operation.

### RECOMMENDED BOOKS:

1. Power Station Practices M.V. Dashpandey
2. Power Station Practices Soni, Gupta.

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-704(C), ELECTIVE-I**  
**TITLE: ENERGY AUDITING**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	40

### SECTION-I

**Energy Scenario:** Energy needs of growing economy, Long term energy scenario, Energy pricing, Energy sector reforms, Energy and environment: Air pollution, Climate change, Energy security, Energy conservation and its importance, Energy strategy for the future, Energy conservation Act-2001 and its features.

**Energy Management and Audit:** Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach-understanding energy costs, Bench marking, Energy performance,

Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit instruments

**Material and Energy Balance:** Facility as an energy system, Methods for preparing process flow, Material and energy balance diagrams.

**SECTION-II**

**Financial Management :** Investment-need, Appraisal and criteria, Financial analysis techniques-Simple payback period, Return on investment, Net present value, Internal rate of return, Cash flows, Risk and sensitivity analysis, Financing options, Energy performance contracts and role of ESCOs.

**Electrical System:** Electricity tariff, Load management and maximum demand control, Power factor improvement, Distribution and transformer losses. Losses in induction motors, Motor efficiency, Factors affecting motor performance, Rewinding and motor replacement issues, energy efficient motors. Light source, Choice of lighting, Luminance requirements, and Energy conservation avenues

**RECOMMENDED BOOKS:**

- |  |                                      |
|--|--------------------------------------|
| 1. Handbook on Energy Audit and Environment Management | Y.P.Abbi and S.Jain                  |
| 2. Energy Conservation                                 | P.Diwan and P.Dwivedi                |
| 3. Handbook of Energy Audits                           | A.Thumann, W.J. Younger and T.Niehus |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

<b>CLASS: B.E. 7<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks</b>
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	
<b>COURSE CODE: EE-705</b>				
<b>TITLE: MINOR PROJECT</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>150</b>

The project will be assigned to the students towards the end of 6<sup>th</sup> semester and will start working on these projects at the commencement of their 7<sup>th</sup> semester. The topic of the project will be decided as per the developments taking place in the field of Electrical Engineering.

This may require complete literature survey, design, fabrication, simulation of models and/or some preliminary laboratory experiments etc. The same project can be extended to 8<sup>th</sup> semester also.

Distribution of Marks as per University statutes:

- Total Marks for End semester Evaluation = 150 marks
- |                                |            |     |
|--------------------------------|------------|-----|
| 1. Presentation/ Demonstration | = 45 marks | 30% |
| 2. Viva-voce                   | = 45 marks | 30% |
| 3. Actual work done            | = 60 marks | 40% |

**Award of Marks**

- Marks under (1) and (2) will be awarded by the Departmental committee constituted comprises of convener and at least two members.
- Marks under (3) will be awarded by the concerned Project Guide(s)/supervisor(s).

<b>CLASS: B.E. 7<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks</b>
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	
<b>COURSE CODE: EE-706</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>100</b>
<b>TITLE: SEMINAR</b>				

This will involve a detailed study of a topic of interest reproduced in the candidate's own style. For this, a student has to prepare a seminar by doing proper survey of literature, compilation of information so gathered and then presentation of the same followed by question-answer session. The report of which has to be submitted by the student well before the conduct of seminar. The handout submitted by the student will be in accordance with the standards of technical papers.

Guidelines and evaluation of Seminar in 7<sup>th</sup> semester:

The topic of the Seminar is to be finalized and approved by the departmental committee by the end of 6<sup>th</sup> Semester. The committee shall have a convener and atleast two members.

Distribution of Marks:

- Total Marks for Seminar Evaluation = 100 marks
1. Project Report = 30 marks
  2. Presentation = 50 marks
  3. Attendance = 20 marks.

**Award of Marks:**

- Marks Under (1) will be awarded by the Seminar Incharge.
- Marks Under (2) and (3) will be awarded by the Departmental committee constituted for the purpose.

<b>CLASS: B.E. 7<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks</b>
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	
<b>COURSE CODE: EE-707</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>50</b>
<b>TITLE: INDUSTRIAL TRAINING</b>				

The students are required to take practical training during summer vacations for about 4 to 6 weeks duration in PSUs/Private Industries/DRDO/ISRO/BARC/Power Grid Corporation /Power Stations/Electric sub-stations/ Practical Training Centre etc. After completion of the training, the students should submit a training report along with the certificate issued by the Concerned Department for evaluation purpose.

Guidelines for evaluation of Practical Training:

The evaluation shall be done by the departmental committee by the end of 7<sup>th</sup> semester. The committee shall have a convener and atleast two members.

Distribution of Marks as per the University statues:

1. Report = 20 40%
2. Viva-Voce = 15 30%
3. Miscellaneous Marks = 15 30%

Due weightage will be given those who have undertaken outside the state & based on the profile of the Industry.

**Award of the Marks:**

Marks (1), (2) & (3) will be awarded by the committee constituted for the purpose.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-708**  
**TITLE: SWITCHGEAR AND PROTECTON LAB**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	50

**LIST OF EXPERIMENTS :**

1. Study of an induction disc type over current Relay.
2. To plot the time-current characteristics of an over current Relay.
3. To plot the operating characteristics of a percentage Differential Relay.
4. To plot the operating characteristics of a state over current Relay.
5. To study the operation of a Buchholz's Relay.
6. To plot the operating characteristics of an impedance/Mho type distance Relay.
7. To plot the operating characteristics of a given M.C.B.
8. To study the various parts of a given Air Circuit Breaker.
9. To study the various parts of a given Oil Circuit Breaker.
10. To study the grounding system provided in the Laboratory.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-709**  
**TITLE: POWER SYSTEM-II LAB**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	50

**LIST OF EXPERIMENTS :**

1. To study the various types of underground Cable samples.
2. To derive positive sequence component of given sample of phase current/phase voltage.
3. To derive negative sequence component of a given samples of phase currents/Phase voltage.
4. To derive zero sequence components of a given samples of phase currents/phase voltages.
5. To derive the zero sequence impedance of a given transformer.
6. To derive the positive, negative and zero sequence impedance of a given alternator.

**CLASS: B.E. 7<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-710**  
**TITLE: ELECTRONIC MEASUREMENTS AND**  
**INSTRUMENTATION LAB.**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Practical
0	0	2	0	40

**LIST OF EXPERIMENTS :**

1. Measurement of displacement.
2. Measurement of force.
3. Measurement of temperature.
4. Measurement of pressure.
5. Measurement of flow
6. Digital measurement of A.C. Voltage.
7. Digital measurement of D.C. voltage.
8. Digital measurement of Low Resistance.
9. Digital measurement of Medium & High Resistance.
10. Digital measurement of Electrical power.
11. Measurement of phase & frequency.

## UNIVERSITY OF JAMMU

**COURSE SCHEME**  
**B.E. 8<sup>th</sup> SEMESTER ELECTRICAL ENGINEERING**  
**FOR EXAMINATION TO BE HELD FOR THE BATCH 2014 AND ONWARDS**

Course		Hours Per Week			Marks			
Course Code	Title	L	T	P	Theory	Sessional	Practical	Total
HUM- 813	Industrial Engineering & Production Management	3	2	--	100	50	--	150
EE-802	Power System-III	3	2	--	100	50	--	150
Elective-II EE-803	(A) High Voltage Engineering (B) EHV Transmission (C) Power System Operation & Control (D) Utilization of Electric	3	2	--	100	50	--	150
Elective-III EE-804	(A) Computer aided Design of Electric Machines (B) Industrial Drives (C) Advanced Power Electronics (D) Static Relay	3	2	--	100	50	--	150
EE-805	Major Project	--	--	12	--	--	350	350
EE-806	Power System-III Lab	--	--	4	--	--	50	50
<b>Total</b>		<b>12</b>	<b>8</b>	<b>16</b>	<b>400</b>	<b>200</b>	<b>400</b>	<b>1000</b>

**NOTE :** Students have to select one course each from Elective II & Elective-III.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: HUM-813**  
**TITLE: INDUSTRIAL ENGG. & PRODUCTION**  
**MANAGEMENT**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION-I

**Unit 1:** Management: Meaning, Characteristics, Functions and Scope. Classical Theory of Management: Henry Fayol's Administrative Management Theory & Taylor's Scientific Management Theory. Elton Mayo's Neo-Classical Theory of Human Relations Prospective, Modern Theory of Management: Contingency Approach

**Unit 2:** Entrepreneur: Concept, Difference between Entrepreneur & Intrapreneur, Qualities of Good Entrepreneur, Types of Entrepreneur, Role of Entrepreneur in Economic Development, Entrepreneurship as a career option for Technocrats. Decision Making: Meaning, Characteristics, Importance, Types & Process of Decision making.

**Unit 3:** Total Quality Management (TQM): Concept, Elements & Benefits of TQM. Quality Control: Objectives, Significance, Methods of Quality Control.

### SECTION-II

**Unit 4:** Production Planning and Control: Meaning, Definition, Objectives, Functions and Elements of Production Planning and Control. Advantages of Production Planning and Control.

Just in Time (JIT) Production: Concept, Characteristics, Goals, Components and Elements of JIT Production.

**Unit 5:** Inventory Control: Meaning, Objectives, Classification, Functions of Inventories. Inventory Costs: Simple Economic Order Quantity (EOQ) Model.

**Unit 6:** Plant Location: Importance, Nature of Plant location, Choice of Site for Plant Location. Plant Layout: Definition, Objectives, Types of layout, Factors influencing Plant Layout, Steps in Plant Layout.

### RECOMMENDED BOOKS:

- |  |                        |
|--|------------------------|
| 1. Principles and Practice of Management | Koontz                 |
| 2. Quantitative Techniques in Management | N.D. Vohra             |
| 3. A Management guide to PERT and CPM    | Wiest and Levy         |
| 4. Introduction to operations research   | Hiller and Lieberman   |
| 5. Production Planning and Control       | Samuel Dillon          |
| 6. Principles of Management              | Sharma, Bhalla & Gupta |
| 7. Industrial Engineering                | O.P. Khanna            |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-802**  
**TITLE: POWER SYSTEM-III**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION-I

**Network Equations:** Introduction, Network model formulation, Formation of Y bus by singular transformation.

**Load flow studies:** Introduction, Gauss- Siedel method, Newton- Raphson method, Decoupled load flow studies, comparison of load flow methods.

**Stability Steady State/Transient stability:** Introduction, Dynamics of synchronous machines, power angle equation, node elimination technique, simple systems, steady state stability, transient stability, equal area criterion, numerical solution of swing equations, multi machines stability, factors effecting transient stability.

### SECTION-II

**Optimum Power System:** Introduction, optimal operation of generators on a bus bar, optimal unit commitment, reliability considerations, optimal generation scheduling, power system security, maintenance scheduling, power system reliability.

Surge performance of transmission lines.

#### RECOMMENDED BOOKS:

- |                          |                   |
|--------------------------|-------------------|
| 1. Power System Analysis | Stevenson         |
| 2. Power System Analysis | Nagrath & Kothari |
| 3. Power System Analysis | C.L. Wadhwa       |
| 4. Traveling Waves       | Bewley            |
| 5. Electrical Power      | Bhatnagar/Soni    |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-803 (A), ELECTIVE-II**  
**TITLE: HIGH VOLTAGE ENGINEERING**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

### SECTION-I

**Breakdown of gases** : Kinetic theory of gases production of charged particles in gases, collision ionization, thermal ionization, photo ionization, production of charged particles on solid surface.

Uniform and non-uniform fields, Impulse breakdown of gases, lighting phenomena compresses gases, Electronegative gases and vacuum.

Breakdown of liquid and solid Dielectrics.

Generation of H.V.A.C, D.C and Impulsive voltages.

Cascade transformers, H.V. rectifier circuits, electrostatic generator, impulse generator, equivalent circuit and waveshape control switching surge generators, high frequency generator, laboratory earthing and safety measures.

### SECTION-II

Measurement of H.V.A.C, D.C. and Impulsive Voltages.

Sphere gaps, E.S. Voltmeters, Resistance potential dividers, Capacitance potential dividers, Mixed potential dividers, C.R.O.,

Insulation Design Principles.

Classification of insulating materials, composite dielectrics, fields plotting, H.V bush, awarding and shields insulation coordination.

H.V. Testing

I.S.I Specifications, D.C.A.C. High frequency and impulse testing of insulators/bushing/transformers/arrestors, generators and cables.

### RECOMMENDED BOOKS :

1. High Voltage Engineering C.L. Wadhwa

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 8<sup>TH</sup> SEMESTER****BRANCH: ELECTRICAL ENGINEERING****COURSE CODE: EE-803 (B), ELECTIVE-II****TITLE: EHV TRANSMISSION****DURATION OF EXAM: 3 HOURS****Hours/ Week****Marks Distribution**

L	T	P	Theory	Sessional
3	2	0	100	50

**SECTION-I**

Introduction, need for EHV Transmission, use of bundled conductors, conductor surface gradients, radio noise from EHV lines, insulation requirement of EHV line, electrostatic field of EHV lines, design of EHV lines, Shunt and series compensation, tuned power lines.

**SECTION-II**

Development of H.V.D.C Transmission system-an overview, economic comparison, types of D.C. links, advantages of D.C transmission, operation of converters and inverters, CC and CEA Control, reactive KVA requirement, two terminal of parallel operation of DC and AC lines, use of thyristors, field of application and circuit breaking.

**RECOMMENDED BOOKS :**

- |                                    |              |
|------------------------------------|--------------|
| 1. EHV-AC Transmission             | Beghamudrae  |
| 2. HVDC Power Transmission Systems | K.R. Padiyar |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER****BRANCH: ELECTRICAL ENGINEERING****COURSE CODE: EE-803 (C), ELECTIVE-II****TITLE: POWER SYSTEM OPERATION AND CONTROL****DURATION OF EXAM: 3 HOURS****Hours/Week****Marks Distribution**

L	T	P	Theory	Sessional
3	2	0	100	50

**SECTION-I**

Steady state operation, real and reactive power balance and their effects on system operation. Optimum operating strategies, optimum dispatch neglecting losses. Development of loss formulae, optimum dispatch including losses.

**SECTION-II**

Optimum load flow. Optimal operation of hydrothermal systems. Automatic generation control for single and multi-area cases. Real time control.

**RECOMMENDED BOOKS:**

- |                                     |                   |
|-------------------------------------|-------------------|
| 1. Power System Operation & Control | A.J. Wood         |
| 2. Power System Engineering         | Nagrath & Kothari |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

<b>CLASS: B.E. 8<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks Distribution</b>	
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Theory</b>	<b>Sessional</b>
<b>COURSE CODE: EE-803 (D), ELECTIVE-II</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>100</b>	<b>50</b>
<b>TITLE: UTILIZATION OF ELECTRIC ENERGY</b>					
<b>DURATION OF EXAM: 3 HOURS</b>					

**SECTION-I**

Electrical Utilization. (a) Braking of Motors. (b) Choice of Motors

Traction: Various system of electric traction, feeding of distribution systems, traction motors, series parallel control of train movement, mechanical consideration, trolleys and trams. Electrical cranes and passenger lifts.

**SECTION-II**

Heating and welding: resistance ovens, inductor and dielectric heating, Arc furnaces, Electrical Welding and methods of control.

Illumination: Nature and production of light. Photometric definitions. Incandescent lamps, arc and discharge lamps. Design of illumination schemes for indoor and outdoor uses. Flood lighting.

**RECOMMENDED BOOKS:**

1. Utilization of Electrical Energy      J.B. Gupta
2. Utilization of Electrical Energy      H. Pratap

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

<b>CLASS: B.E. 8<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks Distribution</b>	
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Theory</b>	<b>Sessional</b>
<b>COURSE CODE: EE-804 (A), ELECTIVE-III</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>100</b>	<b>50</b>
<b>TITLE: COMPUTER-AIDED DESIGN OF ELECTRICAL MACHINES</b>					
<b>DURATION OF EXAM: 3 HOURS</b>					

**SECTION-I**

**Computer Aided Basic Considerations ;** standards and standardizations specifications; construction and materials; class and duty.

Main dimensions and output equations of transformer and rotating machines; specific loading, separation of parameters.

Magnetic Circuits and Electrical circuit calculations.

**SECTION-II**

Computer Aided Design of transformers and rotating machine.

Computers in design, computer algorithms and flow charts for magnetic circuit and electrical circuit quantities, heating and cooling performance calculations. Complete computer-aided design of transformer and 3-phase induction motors.

**RECOMMENDED BOOKS :**

1. Principle of Electrical Machine with computer Programme      S.K. Sen Oxford.
2. Computer-aided design of Electrical Machines      M. Ramamoorthy

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-804 (B), ELECTIVE-III**  
**TITLE: INDUSTRIAL DRIVES**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

**SECTION-I**

Drives and their classification, speed torque characteristics of industrials equipment; Four-quadrant operation of electric motors, speed-torque characteristics of shunt, series, compound and induction motors under running and braking operation, starting and braking control of induction motors.

**SECTION-II**

**Automatic starting control principles;** typical automatic starting breaking and reversing control circuits of shunt series and induction motor using magnetic contactors. Master switches and relays.

**RECOMMENDED BOOKS:**

1. Electrical Drives                      Chilkin
2. Electrical Drives                      G.K. Dubey
3. Electrical Drives                      S.K. Pillay

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-804 (C)**  
**TITLE: ADVANCED POWER ELECTRONICS**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

**SECTION-I**

**DC- DC Converters :**

**Non-isolated DC-DC converters :** Buck, Boost, Buck-Boost, Cuk converters in DCM and CCM.

**Isolated DC-DC converters :** Fly back, Forward, Push-Pull, Half Bridge and Full-Bridge converters in DCM and CCM.

**AC to AC Converters :** Three phase to single phase cycloconverters: Half wave and full wave. Three phase to three phase cycloconverters. Output voltage equation of cycloconverters.

**Phase controlled rectifiers :** Effect of source impedance. Single-phase and three phase Dual converter.

**Inverters :** Forced-commuted Thyristor, Three phase bridge inverters, Reduction of harmonics.

**SECTION-II**

**Facts Devices:** Concept of FACTs, FACT Devices: TCR (Thyristor Controlled Reactor), TSC (Thyristor Switched Capacitor), STATCOM (Static Synchronous Compensator), SSSC (Static Series Synchronous Compensator), UPFEC (Unified Power Flow Controller)

**HVDC Systems :** Evolution of HVDC systems, Comparison of HVDC and HVAC systems, Choice of HVDC transmission systems, Types of HVDC Systems.

Various applications of Power Electronics in residential, commercial and industrial environments, Interdisciplinary nature of Power Electronics.

**RECOMMENDED BOOKS :**

- |  |                          |
|--|--------------------------|
| 1. Power Electronics Converters, Applications & Design | Mohan, Undeland, Robbins |
| 2. Power Electronics                                   | M.H. Rasid               |
| 3. Power Electronics & Motor Drives: Advance & Trends  | Bimal K. Bose            |
| 4. Understanding Facts                                 | Hingorani                |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

**CLASS: B.E. 8<sup>TH</sup> SEMESTER**  
**BRANCH: ELECTRICAL ENGINEERING**  
**COURSE CODE: EE-804 (D), ELECTIVE-III**  
**TITLE: STATIC RELAY**  
**DURATION OF EXAM: 3 HOURS**

Hours/ Week			Marks Distribution	
L	T	P	Theory	Sessional
3	2	0	100	50

**SECTION-I**

Philosophy of power system protection and its requirements-conventional Vs static relays-generalized characteristics and operational equations of relay-steady state and transient performance of signal deriving elements, signal mixing techniques and measuring techniques CTs and PTs in relaying schemes-saturation –stabilizing resistors.

Static relay circuit using analog and digital ICs for overcurrent, differential and directional relays.

Static relay circuits for generators loss of field, under frequency, desistance, impedance, reactance mho and reverse power relays.

**SECTION-II**

Static relay circuits for carrier current protection – steady state and transient behaviour of static relays-testing and maintenance of relays-tripping circuits using thyristors.

Microprocessor based relay-hardware and software for the measurement of voltage, current, frequency and phase angle, Microprocessor based implementation of overcurrent, directional, impedance and mho relays.

**RECOMMENDED BOOKS :**

- |   |                  |
|---|------------------|
| 1. Protective Relays-Their Theory and Practice (Vols. I & II) | VAN.C.Warrington |
| 2. Power system Protection –Static Relays                     | T.S. MADHVAN RAO |
| 3. Fundamentals of Microprocessors and Microcomputers         | B.RAM            |

**NOTE :** There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

<b>CLASS: B.E. 8<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks</b>
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	
<b>COURSE CODE: EE-805</b>	<b>0</b>	<b>0</b>	<b>12</b>	
<b>TITLE: MAJOR PROJECT</b>				<b>350</b>

The student will complete their assigned project work initiated in 7<sup>th</sup> semester under course Code EE-705 and submit a detailed project report individually to the Head of the department.

**Guidelines for evaluation of Project work in 8<sup>th</sup> semester :**

**Sub-distribution of marks :**

- For External Examiner : 100
- For Internal Examiner : 250

**Sub distribution of internal Marks :**

- Mark distribution of internal Project work as per the University statutes shall be based on :
  1. Viva-Voce = 75 30%
  2. Presentation = 75 30%
  3. Report = 100 40%

Total	=	<table border="0"> <tr> <td style="border-top: 1px solid black; border-bottom: 1px solid black;">250</td> </tr> </table>	250
250			

<b>CLASS: B.E. 8<sup>TH</sup> SEMESTER</b>	<b>Hours/ Week</b>			<b>Marks Distribution</b>	
<b>BRANCH: ELECTRICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Theory</b>	<b>Practical</b>
<b>COURSE CODE: EE-806</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>50</b>
<b>TITLE: POWER SYSTEM-III LAB</b>					

The following problems are to be worked out by the students with the help of a computer.

1. Load flow Analysis of a given power system G.S. Technique
2. Load flow analysis of a given power system N.R. Technique
3. Fault analysis of a given power system

**RECOMMENDED BOOKS :**

1. Computer Analysis of a Power System Stag El. Abid.