

# **Faculty of Engineering & Technology**

Study and Evaluation Scheme

Of

**Bachelor of Technology**

**B.Tech. – Electrical Engineering**

**II, III & IV Year**

(Applicable w.e.f Academic Session 2013-16 till revised)



**AKS UNIVERSITY, SATNA**

Study and Evaluation Scheme

**\*\* The University Authorities reserve all the rights to make any additions/ deletions or changes/ modifications to this syllabus as deemed necessary.**

**AKS University, Satna**  
Sherganj, Panna Road, Satna (MP) 485001

**Study & Evaluation Scheme**  
**of**  
**Bachelor of Technology (Electrical Engineering )**  
**SUMMARY**

<b>Programme :</b>	<b>B.Tech (EE)</b>		
<b>Duration :</b>	Four year full time (Eight Semesters)		
<b>Medium :</b>	English		
<b>Minimum Required Attendance :</b>	75 %		
<b>Maximum Credits:</b>	166+54 (First Year)= <b>220</b>		
<b>Evaluation Assessment :</b>	<b>Internal</b>	<b>External</b>	<b>Total</b>
	50	100	150

**Internal Evaluation (Theory/ Practical Papers)**

	<b>Sessional-I</b>	<b>Sessional-II</b>	<b>Continuous Assessment &amp; attendance</b>
	10	10	10+20= 30
<b>Duration of Examination :</b>	<b>External</b>	<b>Internal</b>	
	3 hrs.	2 hrs	

To qualify the course a student is required to secure a minimum of 36% marks in aggregate including the semester end examination, internal assessment evaluation (Both theory & Practical Papers)

A candidate who secures less than 36% or Grade ‘D’ of marks in a Subject/Paper(s) shall be deemed to have failed in that Subject/Paper(s). In case a student has secured less than 36% or Grade ‘R’ in Subject/Paper(s), he/she shall be deemed to re-appear (ATKT Examination) in Subject/Paper(s) to achieve the required percentage (Min. 36%) or grade (Min. D) in the Subject/Paper(s).

***Question Paper Structure***

- 1. The question paper shall consist of 26 questions in three Sections. Out of which Section-A shall be of Objective type 10 questions and will be compulsory. (weightage 2 marks each).*
- 2. Section-B shall contain 10 Short answer type questions and students shall have to answer any eight (weightage 5marks each).*
- 3. Out of the remaining six question s are long answer type questions, student shall be required to attempt any four questions. The weightage of Questions shall be 10 marks each.*

**Faculty of Engineering & Technology**  
**Department of Electrical Engineering**

**B.Tech & B.Tech+M.Tech (Integrated)**

**(Electrical Engg.)**

**III Semester**

**TEACHING & EXAMINATION SCHEME**

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1.	03MS301	Mathematics-III	3	1		4	27
2.	03EE302	Electrical Machine-I	3	1		4	
3.	03EE303	Electrical Power Generation	2	1		3	
4.	03EE304	Electrical And Electronic Materials	3	1		4	
5.	03EE305	Network Analysis And Synthesis	3	1		4	
6.	03EE306	Solid State Devices	3	1		4	
7.	03SD307	SSD		-	2	1	
1.	03EE351	Electrical Machine-I (Lab)			2	1	
2.	03EE352	Electrical Power Generation (Lab)			2	1	
3.	03EE353	Network Analysis And Synthesis (Lab)			2	1	

**Faculty of Engineering & Technology**  
**Department of Electrical Engineering**  
**B.Tech & B.Tech+M.Tech (Integrated)**

(Electrical Engg.)

IV Semester

**TEACHING & EXAMINATION SCHEME**

S.NO.	SUBJECT CODE	SUBJECT NAME	L	T	P	CREDIT
1.	03EE401	ELECTRICAL MACHINE –II	4	1		5
2.	03MT402	PRINCIPAL OF MANAGEMENT	3	1		4
3.	03EE403	ELECTROMAGNETIC THEORY	3	1		4
4.	03EE404	ELECTRICAL MEASUREMENT AND INSTRUMENT	4	1		5
5.	03EE405	POWER TRANSMISSION AND DISTRIBUTION	4	1		5
6.	03SD406	SOFT SKILL DEVELOPMENT			2	1
7.	03EE451	POWER TRANSMISSION AND DISTRIBUTION (Lab)			2	1
8.	03EE452	ELECTRICAL MACHINE –II(Lab)			2	1
9.	03EE453	ELECTRICAL MEASUREMENT AND INSTRUMENT (Lab)			2	1
TOTAL						26

**Faculty of Engineering & Technology**  
**Department of Electrical Engineering**

**B.Tech & B.Tech+M.Tech (Integrated)**

**(Electrical Engg.)**

**V Semester**

**TEACHING & EXAMINATION SCHEME**

S.No.	Paper Code	Subjects	L	T	P	Credit	Total Credit
1.	03EE501	Analog And Digital Communication	3	1		4	26
2.	03EE502	Analog And Digital Electronics	3	1		4	
3.	03EE503	Electronic Instrumentation	3	1		4	
4.	03EE504	Power Electronics	3	1		4	
5.	03EE505	Switchgear And Protection	3	1		4	
6.	03SD506	SSD		-	2	1	
1.	03EE551	Analog And Digital Electronics (Lab)			2	1	
2.	03EE552	Electronic Instrumentation (Lab)			2	1	
3.	03EE553	Switchgear And Protection (Lab)			2	1	
4.	03EE554	Power Electronics (Lab)			2	1	
5.	03EE555	Simulation Lab (MATLAB)			2	1	

**Faculty of Engineering & Technology**  
**Department of Electrical Engineering**

**B.Tech (Electrical Engg.)**

**VI Semester**

**TEACHING & EXAMINATION SCHEME**

<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>	<b>Total Credit</b>
1.	03EE601	Electrical Drives	4	1		5	28
2.	03EE602	Electrical Machine Design	4	1		5	
3.	03EE603	Linear Control System	4	1		5	
4.	03EE604	Microprocessor And Microcontroller	4	1		5	
5.	03EE605	Signal And System	3	1		4	
1.	03EE651	Electrical Drives (Lab)			2	1	
2.	03EE652	Electrical Machine Design (Lab)			2	1	
3.	03EE653	Linear Control System (Lab)			2	1	
4.	03EE654	Microprocessor And Microcontroller (Lab)			2	1	

**Faculty of Engineering & Technology**  
**Department of Electrical Engineering**

**B.Tech (Electrical Engg.)**

**VII Semester**

**TEACHING & EXAMINATION SCHEME**

<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>	<b>Total Credit</b>
1.	03EE701	Energy Conservation And Management	3	1		4	30
2.	03EE702	Power System Analysis And Control	4	1		5	
3.	03EE703	Utilization Of Electrical Power	4	1		5	
4.		Elective-1	4	1		5	
5.		Elective-2	4	1		5	
1.	03EE751	Power System Analysis And Control (Lab)			2	1	
2.	03EE752	Major Project ( Planning And Literature Survey)			8	4	
3.	03EE753	Industrial Training ( 2 weeks )			2	1	

**Faculty of Engineering & Technology**  
**Department of Electrical Engineering**

**B.Tech (Electrical Engg.)**

**VIII Semester**

**TEACHING & EXAMINATION SCHEME**

<b>S.No.</b>	<b>Subject Code</b>	<b>Subject Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>	<b>Total Credit</b>
1.	03EE801	Computer Aided Machine Design	4	1		5	29
2.	03EE802	Power System Planning And Reliability	4	1		5	
3.		Elective-3	3	1		4	
4.		Elective-4	3	1		4	
1.	08EE851	Major Project			16	8	
2.	08EE852	Modelling And Simulation Lab			6	3	



**B.TECH. (Electrical Engineering)**  
**III SEMESTER**  
**ENGINEERING MATHEMATICS-III**

**Unit – I: Function of Complex variable**

- Definition, derivatives of complex function, Analytic function.
- Cauchy-Riemann equations, in Cartesian form and polar form.
- Conjugate function, Harmonic function, Methods for finding the analytic function.
- Cauchy's integral theorem, Cauchy's integral formula for analytic function.
- Poles and singularities of analytic function, Residue theorem (without proof) and its application.

**Unit – II: Numerical Techniques – I**

- Finite differences: Difference table [Forwarded Difference operator, Backward Difference operators and central Difference operator]
- Interpolation: Newton-Gregory forward and backward interpolation formula for equal intervals, Gauss's forward and backward interpolation formula for equal intervals, Gauss's central difference formula for equal intervals.
- Stirling's formula, Bessel's formula, Everett's formula for equal intervals.

**Unit – III: Numerical Techniques – II**

- Numerical Differentiation : Newton's forward difference formula and Newton's backward difference formula for derivative, Gauss's forward difference formula for derivative, Newton's divide difference formula for derivative.
- Lagrange's interpolation formula for unequal intervals and Newton's divided difference interpolation for unequal intervals.
- Numerical integration: Trapezoidal rule, Simpson's one third rule, Simpson's three-eight rules, and Weddle's rule.

**.Unit – IV Numerical Techniques –III**

Numerical solution of algebraic and Transdantal equations: Bisection method, Secant method, Regular-falsi method, Newton-Raphson method and Graeffe's root squaring method.

- Numerical solution of ordinary differential equations: Taylor's series method, Euler's method, Euler's modified method, Picard's method, Runge- Kutta method.
- Solution of simultaneous algebraic equation: Gauss- Seidal method, Gauss elimination method, Guass-jordan method.

**Unit – V Probability Distribution**

- Binomial Distribution: Hypothesis, characteristics, mean, variance and standard deviation and moments.
- Poisson distribution: Hypothesis, characteristics, condition for Poisson distribution, mean, variance and standard deviation.
- Normal Distribution: Standard normal distribution, properties of normal curve.
- Curve fitting: Method of least squares, Fitting of straight lines, and parabola of second degree.

**Text Books:**

1. D.C. Agrawal, Engineering Mathematics-III, Sai prakasan
2. H.K.Das, Basic Engineering Mathematics-III, S.Chand & company Ltd.
3. D. K. Jain., Engineering Mathematics-III
4. Sonendra Gupta, Engineering Mathematics-III, Dhanpat Rai Publishing Company(P) Ltd.

**Reference Books:-**

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
3. Chandrika Prasad, Advanced Mathematic for Engineers, Prasad Mudranalaya,1996.
4. B.V.Ramana,Higher Engineering mathematics,Tata Mcgraw-Hills Publishing Company Limited.

**B.TECH. (Electrical Engineering)**  
**III SEMESTER**  
**NETWORK ANALYSIS AND SYNTHESIS**

**Unit – I: Graph Theory**

Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Nodal methods of analysis

**Unit – II: Network Theorems (Applications to ac networks)**

Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

**Unit – III : Network Functions**

Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot.

**Unit – IV : Two Port Networks**

Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T &  $\Pi$  Representation.

**Unit – V : (a) Network Synthesis**

Positive real function; definition and properties; properties of LC, RC and RL driving point functions.

**(b) Filters:** Characteristics, impedance, passive and active filter fundamentals, low pass, highpass, (constant K type) filters, and introduction to active filters.

**Text Books:**

- 1 M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
- 2 A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.
- 3 C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers,
- 4 D.Roy Choudhary, "Networks and Systems" Wiley Eastern Ltd.
- 5 Donald E. Scott: "An Introduction to Circuit analysis: A System Approach" McGraw Hill

**Reference Books:**

- 6 M.E. Van Valkenburg, "An Introduction to Modern Network Synthesis",Wiley Eastern Ltd
- 7 N.C. Jagan and C. Lakshminarayana, "Newwork Analysis" B.S. Publications, 2008.
- 8 K.S. Suresh Kumar, "Electric Circuits and Networks" Pearson Education, 2009.
- 9 A Ramakalyan, "Linear Circuits: Analysis and Synthesis" Oxford University Press, 2005.

**LIST of EXPERIMENTS**

1. To observe Response of R,L and C to A.C supply. Observe the current and voltage wave forms on C. R. O. and determine magnitude and phase angle of voltage and current.
2. To verify the superposition theorem applicable to D.C. circuit.
3. To verify Thevenins theorem applicable to D.C circuit
4. To verify Norton's theorem applicable to D.C circuit
5. To verify the maximum power transfer Theorem applicable to D.C. circuit.
6. Determination of z and h parameters for network and computation of y and ABCD parameters.
7. Determination of driving point and transfer functions of two port network ladder network and verify with theoretical values
8. Verification of parameter properties in interconnected two port networks series, parallel and cascade also study loading effect in cascade.
9. To determine attenuation characteristics of a low pass / high pass active filters

**B.TECH. (Electrical Engineering)  
III SEMESTER**

**ELECTRICAL MACHINES-I**

**UNIT – I: DC Generators**

Electromagnetic principle of DC machine, constructional details, production of voltage and torque, BLV and BLI concepts, classification of DC machine, conditions of self excitation, Cross-field machines, armature winding, armature reaction and its effect, flux and mmf waves, effect of brush shift, commutation, methods of improving commutation, Operating characteristics of DC generator, parallel operation.

**UNIT – II: DC Motors**

DC machine as motor, electrical and mechanical characteristics of DC motor, starting and speed control of DC motors, losses in DC machines, Testing of DC machines, Swinburne's test, regenerative and retardation test.

**UNIT – III: Single Phase Transformer**

Review of transformer theory: Construction and Principle of operation of single phase transformer, equivalent circuit representation of a practical transformer, Phasor diagrams under no load and load condition, Auto-transformer equivalent circuit and phasor diagram.

**UNIT – IV: Three Phase Transformer**

Three-phase transformers, core and shell type transformer, three-phase tank, three-phase unit, Different connections and vector groups, three winding transformer connections, parameters of three winding transformer, coupled circuit view point.

**UNIT – V: Parallel Operation And Testing Of Single Phase and Three Phase Transformers**

Parallel operation of single-phase and three-phase transformer, open delta, Scott connection, back-to-back test, separation of losses, excitation phenomenon in transformers. transformer cooling, pulse transformer, wide band transformer.

**Text Books:**

1. Electrical Machines by Smarajit Ghosh, Pearson Education
2. Performance & Design of A.C. Machines by M.G. Say, C.B.S. Publishers

**Reference Books:**

1. Performance & Design of D.C. Machines by A.E. Clayton & Hancock, C.B.S. Pbs.
2. Electric Machines by Nagrath & Kothari, TMH Pbs.
3. Electric Machines by P.K. Mukherjee & S.Chakravarti, Dhanpat Rai
4. Electrical machines by B. R, Gupta, New age international.

## **LIST of EXPERIMENTS**

1. Study of D.C. Machine (Parts)
2. Open characteristics( $E_b/ I_f$ ) of a D.C. Generator
  - a. Series
  - b. Shunt
  - c. Compound
3. External characteristics of D.C. Generator ( $V/I_f$ ).
4. Control the speed of D.C. Series motor.
5. Perform Swinburn's test of D.C. machine.
6. Perform O.C. & S.C. test of single phase transformer.
7. Perform Load test on single phase transformer.
8. Operate two single phase transformer in parallel having.
9. Perform sumpner's test on single phase transformer.
10. Perform heat run test of single phase transformer.

Prepare a report on transformer accessories and cooling methods of a substation.

## **B.TECH. (Electrical Engineering)**

### **III SEMESTER ELECTRICAL POWER GENERATION**

#### **UNIT –I: Introduction to Generating station & Loads**

Choice of Power station and units: Types of power station, choice of type of generation, choice of size of generator units and number of units. Definition of connected load, maximum load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor, plant utilization factor, load duration curve, mass curve

#### **UNIT –II: Steam Power station**

Main parts and working of a steam station, characteristics of steam turbines, characteristics of turbo alternators, steam station auxiliaries, steam station layout, super pressure steam stations.

#### **UNIT- III: Hydro power stations**

Hydrology, hydrographs, flow duration curve, mass curve, types of dam, principle of working of a hydro electric plant, tidal power plant, power to be developed, types of turbine and their characteristics, characteristics of generators, power station structure and layout.

#### **UNIT- IV**

**(A) Nuclear power stations:** main parts of nuclear power station principle of nuclear energy, main parts of reactor, types of power reactor, location of nuclear power plant, layout of power station, reactor control, nuclear waste disposal.

**(B) MHD generation:** history of MHD generation, principle of MHD generation, MHD cycles and working fluids, open cycle MHD system, closed cycle MHD system, advantage of MHD generation.

#### **UNIT -V**

**(A) New Energy Sources:** Solar radiation, Solar energy collectors, Conversion of solar energy into electric energy, Solar hydrogen energy cycle, Wind mills, Tidal power generation schemes, Tidal barrage, Environmental aspects of new and old electric energy generation.

**(B) Economic operation of power systems:** Criteria for distribution of load between units of a plant and between plants, transmission loss as a function of plant generation, loss formula coefficients, brief aspects of load dispatching.

#### **Text Books:**

1. Generation of Electrical Energy by B.R. Gupta, S.Chand Pbs.
2. Electric Power Station, Car, T.H.,Chappman & Hall

#### **Reference Books:**

1. Elements of Electric Power Station Design by M.V. Deshpande
2. A Course in Electrical Power by Soni Gupta Bhatnagar, Dhanpat Rai
3. A Course in Electrical Power by J.B.Gupta, Kataria Pbs.

## **B.TECH. (Electrical Engineering)**

### **III SEMESTER ELECTRICAL & ELECTRONICS MATERIALS**

#### **UNIT – I: Crystal Structure of Materials**

**A.** Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth

**B.** Energy bands in solids, classification of materials using energy band..

#### **UNIT – II: Conductivity of Metals**

Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

#### **UNIT – III: Mechanism of Conduction in semiconductor materials**

Types of semiconductors, current carriers in semiconductors, Hall effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials

#### **UNIT – IV: Magnetic Properties of Material**

Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Para-magnetism, Ferromagnetism, Anti-ferromagnetism and Ferrimagnetisms, magneto striction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

#### **Unit V: Dielectric Materials**

Behavior of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behavior in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo-electricity, Properties and Applications of gaseous(H<sub>2</sub>, N<sub>2</sub>, SF<sub>6</sub> etc), liquid ( transformer oil, capacitor oil, paints etc ) and solid (fibrous, paper board, wood, plastic, mica, ceramic material, rubber etc.) insulators.

#### **Text Books :**

- 1 A.J. Dekker, "Electrical Engineering Materials" Prentice Hall of India
- 2 R.K. Rajput, " Electrical Engg. Materials," Laxmi Publications.
- 3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S.Chand

#### **References :**

- 1 Solymar, "Electrical Properties of Materials" Oxford University Press.
2. Ian P. Hones, " Material Science for Electrical and Electronic Engineering," Oxford University Press.
- 3 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
- 4 T. K. Basak, "Electrical Engineering Materials" New age International.

## **B.TECH. (Electrical Engineering)**

### **III SEMESTER SOLID STATE DEVICES**

#### **UNIT I**

Diodes characteristics, equivalent circuit, Junction capacitance of diode and applications as Clipping, Clamping circuits, Voltage doublers, special purpose diodes- photodiode, LED, tunnel diode, Varactor diode, pin diode.

#### **UNIT II**

Diode Applications Rectifiers: half wave and full wave bridge rectifier circuit , filters for rectifiers. Shunt, Series & Zener voltage regulators.

#### **UNIT III**

Input and output characteristics of transistor circuits, various Biasing - Purpose of biasing, dc operating point, dc load line, different biasing techniques – Base bias, Emitter bias, Voltage divider bias, Collector feedback bias, Thermal Runaway, Thermal stability. ac load line, graphical analysis, current, voltage & power gain, input and output impedance, analysis using h-parameters, cascading.

#### **UNIT IV**

FET & MOSFET- The JFET, pinch off voltage, JFET V-I characteristics, FET small signal model, depletion mode MOSFET, enhancement mode MOSFET, low frequency common source and common drain amplifiers, FET biasing, FET as a voltage variable resistor. The common source and common drain amplifier at high frequencies, MOSFET as a switches.

#### **UNIT V**

Feedback amplifier and oscillators: General Feedback Theory, current and voltage feedback, Effect of negative feedback, condition for oscillation, Wein bridge` and RC phase shift oscillator, Hartley and Colpitts oscillator, crystal oscillator, Tunnel diode oscillator.

#### **Text Books:**

1. Electronic Devices – Millman & Halkias
2. Electronics Principles – A.P.Malvino

#### **Reference Books:**

1. Electronic Circuit Discrete and Integrated – Donald I. Schilling
2. Electronic Devices – David Bell

#### **List of Experiment**

1. To plot and study forward and reverse characteristics of a P-N junction diode.
2. To study half wave and full wave rectifier.(with and with out filter)
3. To study bridge type rectifier.(with and without filter)
4. To study and plot the input and out put characteristics of transistor in common emitter mode.
5. To plot and study the input &output characteristics of transistor in common base mode.
6. To plot and study the characteristics of FET.
7. To plot and study the characteristics of MOSFET.
8. To study and measure the frequency of a Hartely oscillator.
9. To study and measure the frequency of a Collpitts oscillator.
10. To study and measure the frequency of a R.C. phase shift oscillator



## **SSD- CSEP (Communication skills Enhancement Program)**

### **3rd Semester**

**B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag./B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/B.Sc. (IT)/Diploma (Engg.)**

**CSEP PROGRAM:** This programme is devised to give you all an exposure to the language used in various communication activities. The objective of the programme is to enhance our communication skills. Research says that the more you listen and speak a language the faster you learn. In these sessions, we are going to practice to speak sentences and words used in different situations. Once you have the command on the language, you can use it for any context; be it interviews, prese

ntations, business, technology so on and so forth.

Learning through activities is more effective than learning through lectures and books. We are going to provide you with opportunities to make speeches, presentations, interact with various people etc.

#### **Unit-1**

**Thematic structure:** Money, Cricket, A trip to Gizmo world, Culture and Shopping

**Assignment: Progress Test-1**

#### **Unit-2**

**Thematic structure:** Festivals, Computers, Auto mania, Environment and studying abroad.

**Assignment: Progress Test-2**

#### **Unit-3**

Thematic structure: Internet, Fashion & Style, Globalization, all about jobs and Trends in Technology.

**Assignment: Progress Test-3**

#### **Unit-4**

**Conversation Questions:** College, Beauty and Physical attractiveness, Food and eating, Entertainment, Advertising, Films in your own language, Books & reading.

**Activities:** Reading newspaper and news analysis, Role plays, Extempore, JAM, Story creation, Picture description, Group Discussion and celebrity Interview.

**Assignment: Post assessment Test**

**B.Tech. (Electrical Engineering)**  
**Semester-IV**  
**ELECTRICAL MACHINE – II**

**UNIT-I**

**Electrical Machines Principles:** Principle of electromechanical energy conversion, Construction of various rotating machines, Singly excited magnetic system, Co-energy and Field energy, Doubly excited magnetic system, Winding factors, MMF of concentrated and distributed endings, rotating magnetic fields.

**UNIT-II**

**Polyphase Induction Machine:** Cage and slip-ring induction motor, equivalent circuit, phasor diagram, torque-speed(slip) relationship, testing of induction motors, circle diagram. Starting and speed control of induction motors, cogging and crawling, deep bar and double cage induction motors.

**Single Phase Induction Motors:** Constructional features types, double revolving field theory, equivalent circuit. Split phase starting methods & application, Fractional H.P. Motors, Universal Motor.

**UNIT-III**

**Non-Salient Pole Synchronous Machine:** Theory of non-salient pole synchronous equivalent circuit and phasor diagrams of Synchronous machines, saturation effects, armature reaction, open circuit, short circuit and zero power factor lag tests on Synchronous machines. Synchronous reactance, SCR, voltage regulation of alternators by Synchronous impedance, MMF and zero power factor method, steady state power angle characteristics, excitation systems of alternators.

**UNIT-IV**

**Salient Synchronous Machine:** Theory of salient pole Synchronous machine, two-reaction theory, phasor diagram, power angle characteristics, determination of  $X_d$  and  $X_q$ , phasor diagram parallel operation of Synchronous machines, load sharing, operation of Synchronous machines with infinite bus bars, synchronizing torque, active and reactive power flows.

**UNIT-V**

**Synchronous Motor:** Synchronous motor construction, general load/phasor diagram, torque and power in salient and non salient pole motors, V-curves, capability curve, Synchronous machines condenser, starting of Synchronous machines, damper winding, hunting, applications.

**TEXT BOOKS:**

1. Electrical Technology By B.L. Theraja. Vol-II.
2. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai & Co.)

## REFERENCE BOOKS:

1. M.G. Say, Alternating Current Machines, (5<sup>th</sup> Ed.) ELBS, 1986.
2. Electrical Machine by Dr. P.S. Bimbhara (Khanna Publication)
3. Electrical Machines by Nagrath and Kothari (TMH).
4. A.C. Machines by Langs Dorf (Tata McGraw-Hill)

## LIST OF EXPERIMENT :

Experiment can cover any of the above topics, following is a suggestive list (any ten):

1. Parallel operation of two transformers.
2. To study the load sharing by two transformers.
3. To perform Sumpner's (Back to Back) test on two identical transformers.
4. Determine the efficiency of transformer at  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , full load and 1.25 times the full load at 0.85 p.f. lagging.
  
5. To perform open circuit test and short circuit test on single phase transformer.
6. To study the speed control of d.c. motor below the normal range by armature resistance control and to plot speed Vs armature voltage, characteristics.
7. To study speed control of d.c. motor above normal range by field control and to plot speed Vs field current, characteristic.
8. (a) To perform load test on 3-phase induction motor.  
(b) Compute Torque, output power, input power, efficiency, input power factor and slip for every load setting.  
(c) Plot the following performance curve:
  - (i) Slip Vs Output power.
  - (ii) Torque Vs Speed.
9. (a) Perform no load and block rotor test on 3-phase induction motor.  
(b) Using the data obtained above, draw the circle diagram complete in all respect.
10. To perform no load and block rotor test on single phase induction motor.
11. To synchronise a 3-phase alternator with the bus-bar.

**B.Tech. (Electrical Engineering)**  
**Semester-IV**  
**PRINCIPLES OF MANAGEMENT**

**UNIT - I : HISTORICAL DEVELOPMENT**

Definition of Management - Science or Art - Management and Administration - Development of Management Thought - Contribution of Taylor and Fayol - Functions of Management - Types of Business Organisation.

**UNIT - II : PLANNING**

Nature & Purpose - Steps involved in Planning - Objectives - Setting Objectives - Process of Managing by Objectives - Strategies, Policies & Planning Premises- Forecasting - Decision-making.

**UNIT - III : ORGANISING**

Nature and Purpose - Formal and informal organization - Organization Chart - Structure and Process - Departmentation by difference strategies - Line and Staff authority - Benefits and Limitations - De-Centralization and Delegation of Authority - Staffing - Selection Process - Techniques - HRD - Managerial Effectiveness.

**UNIT - IV : DIRECTING**

Scope - Human Factors - Creativity and Innovation - Harmonizing Objectives - Leadership - Types of Leadership Motivation - Hierarchy of needs - Motivation theories - Motivational Techniques - Job Enrichment - Communication - Process of Communication - Barriers and Breakdown - Effective Communication - Electronic media in Communication.

**UNIT - V : CONTROLLING**

System and process of Controlling - Requirements for effective control - The Budget as Control Technique - Information Technology in Controlling - Use of computers in handling the information - Productivity - Problems and Management - Control of Overall Performance - Direct and Preventive Control - Reporting - The Global Environment - Globalization and Liberalization - International Management and Global theory of Management.

**TEXT BOOKS**

1. Harold Koontz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill,1998
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

**REFERENCES**

1. Tripathy PC And Reddy PN, " Principles of Management", Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, "Personnel and Human Resources Management", Prentice Hall of India, 1996
3. JAF Stoner, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, "Engineering Management", Addison Wesley,-2000.

**B.Tech. (Electrical Engineering)**  
**Semester-IV**  
**ELECTROMAGNETIC THEORY**

**UNIT I**

Cartesian, cylindrical & spherical co-ordinate systems, scalar & vector fields, gradient, divergence & curl of a vector field, Divergence theorem & Stokes's theorem, concept of vectors.

Electrostatic Fields – Coulomb's law, electric field intensity due to different charge distribution viz.

line charge, sheet charge, Field due to continuous volume – electric potential, properties of potential function, potential gradient equipotential surfaces, line of force, Gauss law, applications of Gauss law, Gauss law in point form, method of images.

**UNIT II**

Laplace's & Poisson's equations, solution of Laplace's equation, Electric dipole, dipole moment, potential & electric field intensity due to dipole, Behavior of conductors in an electric field. Conductor & insulator, electric field inside a dielectric, polarization, Boundary value conditions for

electric Field, Capacitance & Capacitances of various types of capacitors, Energy stored and energy

density in static electric field, Current density, conduction & convection current density ohms law in point form, equation of continuity.

**UNIT III**

Static Magnetic Field, Biot-Savart's law, Magnetic Field intensity due to straight current carrying filament, circular, square and solenoidal current carrying wire, Relationship between magnetic flux, flux density & magnetic Field intensity; Ampere's circuital law and its applications, magnetic Field intensity due to infinite sheet and various other configurations, Ampere's circuital law in point form, Magnetic force, moving charge in a magnetic field, Lorentz Force on straight and long current carrying conductors in magnetic field, force between two long & parallel current carrying

conductors. Magnetic dipole & dipole moment, a differential current loop as dipole, torque on a current carrying loop in magnetic field, Magnetic Boundary conditions.

**UNIT IV**

Scalar magnetic potential and its limitations, Vector magnetic potential and its properties, vector magnetic potential due to different simple configurations; Self and Mutual inductances, determination of self & mutual inductances, self inductance of solenoid, toroid coils, mutual inductance between a straight long wire & a square loop. Energy stored in magnetic Field & energy

density, Faraday's Law, transformer & motional EMFs, Displacement current, Maxwell's equations

as Generalization of circuit equations, Maxwell's equation in free space, Maxwell's equation for harmonically varying Field, static and steady fields, Maxwell's equations in differential & integral form.

## **UNIT V**

Electro Magnetic Waves : Uniform plane wave in time domain in free space, Sinusoidally time varying uniform plane wave in free space, Wave equation and solution for material medium, Uniform plane wave in dielectrics and conductors, Pointing Vector theorem, instantaneous, average and complex poynting vector, power loss in a plane conductor, energy storage, Polarization of waves, Reflection by conductors and dielectric – Normal & Oblique incidence, Reflection at surface of a conducting medium, surface impedance, transmission line analogy.

### **TEXT BOOK :-**

1. S.P. Seth; Electromagnetic Field ;Dhanpat Rai & Sons

### **REFERENCES:**

1. Mathew N.O Sadiku; Elements of Electromagnetic; Oxford.
2. N.N. Rao; Element of Engineering Electromagnetic; PHI.
3. William H. Hayt; Engineering Electromagnetic; TMH.

**B.Tech. (Electrical Engineering)**  
**Semester-IV**  
**ELECTRICAL MEASUREMENT AND INSTRUMENTATION**

**UNIT-I**

**Electrical Measurements:** Standard of measurement and errors, Review of indicating and integrating instruments, voltmeter, ammeter (MC/MI/Dynamo meter), wattmeter (Induction/Dynamo Meter Type), multi-meter and energy meter(Induction Type), P.F. meter(Dynamo meter type) frequency meter (Resonance, Weston type), Weston Synchroscope. Idea of M.D. Meter.

**UNIT-II**

**Measurement of Resistance, Inductance and capacitance:** Measurement of low, medium and high resistance by wheat stone bridge, Ammeter, voltmeter method, Kelvin's double bridge method. Insulation resistance by megger. A.C. bridges. Maxwell's bridge, Maxwell's inductance capacitance bridge. Anderson Bridge, Desautty Bridge Wein's bridge. Sources of error in bridge circuits. Q meter and its application and measurement methods.

**UNIT-III**

**Instrument Transformers:** Current and potential transformer, ratio and phase angle errors, rating use. Extension of range of instruments and numerical on it.

**UNIT-IV**

**Electronic Measurements:** Electronic voltmeter, multi-meter, wattmeter and energy meter. Frequency and phase angle measurements using CRO,. Digital counter, frequency meter, voltmeter, multi-meter and storage oscilloscope (in brief).

**UNIT-V**

**Instrumentation:** Transducers, classification and selection of transducers, strain gauges, inductive and capacitive transducers, piezoelectric and hall effect transducers, thermistors, thermocouples, photo diodes, Photo transistors LVDT, RVDT, encoder type digital transducers.

**Text Books:**

1. Electrical & Electronics Measurement & Measuring Instruments by A. K. Sawhney Dhanpat Rai & Sons.

**List Of Experiments:**

- 1.Measurement of current and voltages by low range ammeter and voltmeter respectively with shunt multiplier.
- 2.Measurement of current and voltages by low range ammeter and voltmeter respectively by using current transformer and potential transformer.
- 3.Measurement of active and reactive power in three phase balanced load by single wattmeter method.
4. Measurement of active and reactive power in three phase balanced load by two wattmeter method.
- 5.Measurement of energy in single phase and three phase balanced load using electronic energy meter.
- 6.Measurement of medium resistance by wheatstone bridge.
- 7.Measurement of insulation resistance by meggar.
- 8.Measurement of resistance , voltages and current in A.C. & D.C. circuit by using digital multimeter.
- 9.Measurement of earth resistance by earth tester.
- 10.Measurement of power factor of single phase load by power factor meter.

**B.Tech. (Electrical Engineering)**  
**Semester-IV**  
**POWER TRANSMISSION AND DISTRIBUTION**

**UNIT-I**

Introduction about power system , basic concept of importance of reactive power , Overhead transmission line , transmission line parameter : L , C , R . Calculation of L and C for single phase , three phase , double circuit transmission line , bundled conductor , stranded conductor , GMD ,GMR , effect of earth on capacitance between the conductor , transposition , transmission line communication line interference , radio interference skin effect , skin depth , proximity effect.

**UNIT-II**

Transmission line modeling ,lumped and distributed transmission line, representation and performance of short , medium , and long transmission line , surge impedance loading , velocity of signal through transmission line , voltage regulation of transmission line and transmission efficiency of short , medium , and long ,rigorous method , nominal  $\pi$  & T network , Ferranti effect, ABCD parameter of short, medium ,and long transmission line. Concepts of HVDC and FACTS.

**UNIT-III**

Travelling waves or transient in transmission in transmission line , constant of transmission line , incident wave , reflected wave , transmitted wave , relation between coefficients , power flow through transmission line , method of voltage control-receiving end method and sending end method , load frequency control , power factor correction.

**UNIT-IV**

Overhead Line Insulators : types , string efficiency , voltage distribution in string of suspended insulators , grading ring , method of improving string efficiency.

Mechanical Design of Transmission line : Different types of tower , catenary curve , calculation of sag and tension , sag template , effect of wind and ice loading , vibration dampers , string charts.

Underground cables: Constructional details of various types of cables , oil and gas filled cables , voltage gradient , grading , sheath loss , thermal rating , parameters , corona , factors affecting corona , advantage and disadvantages of corona.

**UNIT-V**

Distribution System : Primary and secondary distribution systems , concentrated and uniformly distributed loads on distributors fed at one and both ends , ring distribution , voltage drop and power loss calculation , radial feeder , Kelvin law , substation layout , tariff : definition & different tariffs for domestic , commercial , industrial application.

**Text Books :-**

- 1 . C.L.Wadhwa , “ Electrical Power Systems”, New age international Ltd. Third Edition , S.Chand & Co.
2. I.J.Nagrath and D.P. Kothari , “ Power System Engineering”, Tata McGraw Hill.
3. V.K.Mehta and Rohit Mehta , “ Principles Of Power System.



**Reference books :-**

- 1 . W.D. Stevenson , “ Elements of Power System Analysis” , McGraw Hill.
- 2 . M.V. Deshpande , “ Electrical Power System Design” , Tata McGraw Hill.

**LIST OF EXPERIMENTS :**

1. To find out the performance of short and medium transmission line by forming simulative network .
2. To study different types of line insulators.
3. To find out voltage distribution and string efficiency by using a simulating network.
4. To study various types of cables and A.C.S.R.
5. To study of current transformer and potential transformer.
6. To find out fusing factor of different types of fuses.
7. Visit to any substation and write a report on it.
8. Visit to any generating station and write a report on it.

## SSD- (Soft Skills Development)

### 4th Semester

**B.Tech (Engg.)/ B.Tech (Ag.)/ B.Tech (BT)/ B.Sc.-Ag(Hons)/ B.Sc (BT)/ B.Pharm/ BBA (Hons) /  
B.Com/B.com(Hons)/ BCA(Hons)/ B.Sc.(IT) Hons./ Diploma (Engg.)**

#### **What is soft Skills?**

The bundle of Skills which helps a person to perform a task better in a more satisfying way for both the performer and spectator ( In personal, Professional and social life).

#### **Why it is required?**

To make a person to perform a task with better understanding of who, where, when, what, how and with whom a job can be executed to deliver the best expected result in perfect timing.

**Learning Outcome:** On completion of the course (SSD), the student should be able:

- Understand the Importance of various skills involved in developing enriching Interpersonal relationship.
- Be more aware of his/her own self- Confidence and values.
- Learn how to go about being a good team player and form an effective team.
- Understand the skills tested and participate effectively in Group discussion.
- Learn the basics of how to make an effective Presentation and have numerous practice Presentation in small groups and larger audiences.

#### **Unit-1**

**Conceptual Sessions:** Soft skills – a general overview, Industry Expectations, SWOT & STAR, Self Discovery, Leap to success- 7 Orientations,

**Activity: Castle Plan.**

**Assignment :** Sentence fluency assignment

#### **Unit-2**

**Conceptual Sessions:** Attitude, Time Management, Goal setting, Team building and leadership,

**Activity: Early Bird and second mouse and Lost at Sea.**

**Assignment :** Goal setting Assignment ( Pre and Post)

#### **Unit-3**

**Conceptual Sessions:** Telephone etiquettes- Preparing for business calls/Making business calls/Telephonic phrases, Dining etiquettes, Email etiquettes, Corporate grooming and dressing

**Activity:** Role play in different scenarios/ Socialization and networking.

**Assignment :** Progress test on general etiquettes.

#### **Unit-4**

**Conceptual Sessions: Group discussion:** Introduction and definition of a GD, Purpose of a GD, Types and strategies in a GD, Do's and Don'ts in GD, Speak to Impress ( Presentation skill), Anchoring in formal setting, Reading Comprehension

**Activity:** GD Practise and Presentation on Company profile.

**Assignment :** Reading Comprehension assignment.

**B.Tech. (Electrical Engineering)**  
**V Semester**  
**ANALOG AND DIGITAL COMMUNICATION**

**Unit-I**

Introduction to Communication Systems: Block diagram, modulation and demodulation, need for modulation, transmission considerations and decibel ratios.

Amplitude modulation, generation of AM waves, concept of SSB and DSB modulation, vestigial sideband transmission, power-relationships, AM receivers, S/N ratio.

**Unit-II**

Phase and frequency modulation, pre-and de-emphasis, generation of FM waves, CW modulation systems, narrowband FM, FM detectors and superheterodyne receivers, S/N ratio.

Concepts of information, Shannon-Hartley theorem, bandwidth-S/N ratio tradeoff, coding, codes for error detection and correction, convolution codes, block and trellis codes.

**Unit-III**

Pulse modulation, PAM, PPM, PWM systems. Concept of PCM, basic coding and quantization, sample and hold, quantization noise, signal to noise ratio, companding, TDM, Delta modulation, adaptive delta modulation, S/N ratio, comparison of PCM, delta and adaptive delta modulation

**Unit-IV**

ASK, PSK, FSK, differential PSK and quadriphase shift keying, synchronization concepts and phase locked loops. Digital modulation techniques, Generation, Detection, equation and bandwidth of amplitude shift keying(ASK) Binary phase shift keying(BPSK), Differential phase shift keying(DPSK),M-Ary PSK, Binary Frequency shift keying(BFSK), M-Ary FSK Quadrature Amplitude modulation(QAM), MODEM, Introduction to probability of error.

**Unit-V**

Block diagram of Fibre optic communication systems, light propagation in optical fibres, numerical aperture and acceptance cones of OFs, losses in optical fibres.

Multiplexing in optic Fibre links. An introduction to telephone exchange systems. Telecommunication traffic, circuit switching, message switching and packet switching. Resource sharing and multiple access techniques. An introduction to microwave, radar and satellite communication.

**List of Experiments:-**

1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM.
3. Time division multiplexing (TDM) and De multiplexing
4. Study of ASK PSK and FSK transmitter and receiver.
5. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculate of parameters.
6. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters.
7. Study of PCM transmitter and receiver.
8. Study of AVC and AFC.
9. Study of super hetrodyne receiver and characteristics of ratio radio receiver.

**References:**

1. Simon Haykins, Communication System. John Willy
2. Wayne Tomasi, Electronic Communication system..

**Textbooks:**

1. Singh & Sapre, Communication System, TMH
2. B.P. Lathi, Modern Digital and analog communication system.

**B.Tech. (Electrical Engineering)**  
**V Semester**  
**ANALOG & DIGITAL ELECTRONICS**

**Unit-I Analog**

Transistor biasing circuits: CE, CC & CB amplifiers, Darlington amplifier. Hparameters and their application in analysis. Class A, B, C, D and S power amplifiers. Pushpull operation. JFET: Biasing and CS, CD and CG amplifier. MOSFET: Depletion type, Enhancement type MOSFET and their biasing.

**Unit-II**

OP-AMP, Differential amplifier and its DC, AC analysis, OP-AMP characteristics, Non-Inverting/Inverting Voltage and Current feedback. Regulated power supplies; Oscillators and Timer (555)

**Unit-III Digital:**

**Logic gates and Logic Families:** Logic gates, Universal gates, transistor as a switching element, Combinational Logic gates Introduction to combinational circuits, arithmetic and logical operation, design of Half adder & full adder, subtractor circuits, parity generator & checker, code converter, decoders, multiplexers, demultiplexers, comparators.

**Unit-IV**

**Sequential Circuits-** Flip-flops, bistable circuits: RS, JK, D, T, Master/Slave Flipflop, race around condition, latches, synchronous and asynchronous counters up & down counters, shift registers, state transition diagram

**Unit-V**

A/D & D/A Converters- D/A converter, accuracy, resolution and precision, variable resistor network, binary ladder, A/D converter, accuracy and resolution, simultaneous conversion, counter method, continuous A/D converter, dual slope, successive approximation method.

**List of Experiments:**

1. Study the diode clipping circuits.
2. Study the diode clamping circuits.
3. Study Zener diode as voltage regulator.
4. Study the common emitter configuration of a transistor.
5. Study the common base configuration of a transistor.
6. Study the common collector configuration of a transistor.
7. Study FET as (a) A source follower (b) A voltage variable resistor.
8. Study FET as (a) A chopper (b) A constant current source.
9. Study the following mathematical operations using Op-Amps:- (a) Addition (b) Subtraction (c) Multiplication (d) Division (e) Integration (f) Differentiation
10. Study the Op-Amp as wave form Generator: (a) Astable Multivibrator (b) Triangle Wave Generator (c) Schmitt Trigger

***Text/Reference Books:***

**Analog:**

1. Millman and Halkias, "Integrated Electronics", Mc Graw Hill.
2. R. Boylested and L. Nashelsky, "Electronics Devices and Circuits", Prentice Hall India.
3. Millman and Halkias, "Electronics Devices and Circuits", TMH Edition.
4. Malcolm Goodge, "Analog Electronics Analysis and Synthesis", TMH Edition.
5. Malvino, "Electronics Principles", TMH Edition.

**Digital:**

1. RP Jain, „Modern Electronics“.
2. AP Malvino and DP Leach, „Digital Principles and applications“.
3. Floyd, „Digital Circuits“.
4. Charles Roth, „Fundamentals of Logic Design“.
5. H. Taub and D. Schilling, „Digital Integrated Electronics“.
6. Gothman, "Digital Electronics".

**B.Tech. (Electrical Engineering)**  
**V Semester**

**ELECTRONIC INSTRUMENTATION**

**Unit-I**

Introduction to CRO, Different parts of CRO, Its Block diagram, Electrostatic focusing, Electrostatic deflection, post deflection acceleration, Screen for CRTs, Graticule, Vertical & Horizontal deflection system, Time base circuit, Oscilloscope probes and transducers, Attenuators, Application of CROs, Lissajous patterns, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog & Digital) Oscilloscopes.

**Unit-II A.C. Bridge Measurement**

Sources and detectors, Use of Bridges for measurement of inductance, Capacitance & Q factor Maxwells bridge, Maxwells inductance capacitance bridge, Hays bridge, Andersons bridge, Owen's Bridge, De-sauty's Bridge, Schering Bridge, High Voltage Schering bridge, Measurement of relative permittivity, Heaviside cambell's bridge, Weins bridge, Universal bridge, Sources of errors in Bridge circuit, Wagner's Earthing device, Q meter and its applications and measurement methods.

**Unit-III Transducers**

Transducers definition and classification, mechanical devices as primary detectors, Synchros, Piezo-Electric transducers, Magnet elastic and magnetostrictive Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, photo diode and photo conductive cells, Photo transistors, Photo optic transducers. Introduction to analog & Digital data acquisition systems-Instrumentation systems used, Interfacing transducers to electronic control & measuring systems Multiplexing - D/A multiplexing A-D Multiplexing, Special encoders. Digital control description

**Unit-IV Signal Generators**

Fixed & variable frequency AF oscillators, Sine wave generators, Standard signal generator, AF Sine and Square wave generator Function generator, Square and pulse generator, Random noise generator, Sweep generator, TV Sweep generator, Marker generator, Sweep- Marker generator, Wobblyscope, Video pattern generator Vectroscope, Beat frequency oscillator Wave analyser Basic wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion, analyzer, spectrum analyzer digital Fourier analyzer.

**Unit-V Digital Instruments**

Advantages of Digital instruments over analog instruments, resolution and sensitivity of Digital meters., Digital Voltmeter - Ramp type, Dual slope integration type, Integrating type, Successive approximation type, Continuous balance DVM or Servo balancing potentiometer type VM. , compression of Electronic & Digital Volt meter, Digital Multimeter, Digital frequency meter, Time period measurement, High frequency measurement, Electronic counter, Digital tachometer, Digital PH meter, Digital phase meter, Digital capacitance meter. Digital display system and indicators like CRT, LED, LCD, Nixies, Electro luminescent, Incandescent, Electrophoretic image display, Liquid vapour display dot-matrix display, Analog recorders, X-Y recorders.

Instruments used in computer-controlled instrumentation RS 232C and IEEE 488, GPIB electric interface.

**List of Experiments:-**

1. Study and Measurement using Maxwell Inductance Bridge.
2. Measurement of inductance of a coil using Anderson Bridge.
3. Measurement of capacitance of a capacitor using Schering bridge.
4. LVDT and capacitance transducers characteristics and calibration.
5. Resistance strain gauge- Strain Measurement and calibration.
6. Measurement of R,L,C & Q using LCR-Q meter.
7. Study & measurement of frequency using Lissajous patterns.
8. Measurement of pressure using pressure sensor.
9. Study of Piezo-electric Transducer and Measurement of impact using Piezo-electric Transducer
10. Measurement of Displacement using LVDT.
11. Measurement of speed of a Motor using photoelectric transducer.
12. Study & Measurement using pH meter.
13. Temperature measurement & Control using thermo couple & using thermistor.

**References:**

1. H.S. Kalsi., Electronic Instrumentation, TMH.
2. E.W. Golding, Electrical Measurement and Measuring Instruments Sir Isaac Pitman and Sons, Ltd. London 1940

**Textbooks:**

1. A.K. Sawhney, Electrical and Electronic measurements and Instrumentation, Dhanpat Rai and Co.

**B.Tech. (Electrical Engineering)**  
**V Semester**  
**POWER ELECTRONICS**

**Unit-I**

Advantages and application of power electronic devices characteristics, Symbol & application of power diodes, power transistors, GTO, Triac, Diac, Power MOSFET, IGBT, LASCR, Fast recovery diode, schottky diode MCTs. Principle of operation of SCR, Two transistor analogy, brief idea of construction of SCR, Static characteristics of SCR, Condition of turn on & off of SCR Gate characteristics, Method for turning on of SCR, Turnoff methods, different commutation techniques (Class A,B,C,D,E, & F Commutation) firing of SCR, Use of pubic transformer and opto isolator in firing, Resistance firing Ckt, Resistance capacitance firing circuit, UJT firing cut, and ramp triggering, firing for 3- $\Phi$  circuit. SCR rating & protection of SCR over voltage, Over current, Suprior firing, Design of snubber circuit and protection of gate of SCR, heating, cooling & mounting of SCR series and parallel operation of SCR, String efficiency & problem associated with series and parallel operation of SCR

**Unit-II**

Operation and analysis of single phase (Half wave & Full Wave) and multiphase (Three Phase) uncontrolled and controlled rectifier circuit with resistive, resistive & inductive load (continuous & non continuous conduction, Fw small & very large inductive loads) and RLE loads. Estimation of average load voltage and load current for above rectifier cirucits active and reactive power input. Effect of free wheeling diode and source inductance on performance of these rectifier circuits . Comparison of mid point & Bridge rectifier circuits.

**Unit-III**

Series and parallel inverter, Voltage source & current source inverter, Single phase and three phase bridge inverter, Self cumulated inverters,, Mc- murray & MC murray bed ford inverters, Voltage control of single phase and three phase bridge inverter, Harmonics & their reduction techniques.

**Unit-IV**

Principle of chopper operation, Various control strategies in chopper, Step up & step-up/step down choppers, chopper configuration (Type A,B, C,D, & E), Steady state analysis of chopper circuits, Current & voltage commutation of chopper circuits Jones & Morgens chopper

**Unit-V**

Single phase (mid point & bridge configuration) and three phase cyclo convertor configuration and operating principles. AC voltage controllers (using SCRs & Traics) single phase full wave controller with R and RL load, Estimation of RMS load voltage, RMS load current and input power factor, three phase AC voltage controller (Without analysis) Dual converter Switched mode voltage regulator buck, Boost, Buch & Boost, Ck regulators.



**List of Experiments:**

1. Study the performance of single-phase half-wave and full-wave uncontrolled rectifiers.
2. Study different firing circuits of SCR.
3. Study forced commutation circuits of SCR.
4. Study protection circuits of SCR: (i)  $dv/dt$  (ii)  $di/dt$  (iii) Over voltage (iv) Over current .
5. Study the characteristics of a Thyristor and a Triac.
6. Study firing circuit of SCR using ramp-comparator scheme.
7. Study firing circuit of SCR using cosine-wave scheme.
8. Study firing circuit of SCR using Op-amps and Gates.
9. Study digital firing circuit of SCR.
10. Study operation of Triac in all four modes and study AC phase control using Triac.

**References:**

1. Power electronics : Circuits, devices & applications,  
M. H. Rashid, PHI
2. Power Electronics, P.C. Jain, TMH

**Textbooks:**

1. P.C. Sen, Power Electronics, TMH
2. Dr. P.S. Bhimbhra, Power Electronics, Khanna Pub.

**B.Tech. (Electrical Engineering)**  
**V Semester**  
**SWITCHGEAR AND PROTECTION**

**Unit-I**

**Switchgear-** Introduction, functions of a circuit breaker, contacts separation and arc phenomenon, theory of arc formation and its extinction, recovery voltage, restriking voltage, interruption of capacitive and inductive currents, resistance switching, double frequency transients, circuit breaker ratings, clearing time, reclosing time, classification of circuit breakers, oil, air-blast, vacuum and SF<sub>6</sub> circuit breakers.

**Unit-II**

**Protection Against Lightning-** Lightning mechanism and its characteristics, over- voltages due to lightning, protection of lines and sub-stations against lightning using shield wires, tower footing resistance, counterpoises, ground wires, rod gaps, lightning arrestors, their construction, working and ratings, surge absorbers and surge divertors.

**Unit-III**

**Insulation Co-ordination:** Impulse volt-time characteristics of electrical apparatus, basic impulse insulation level, insulation levels of sub-station equipments

**Unit-IV**

**Protective Relays:** Introduction, basic requirements, operating principles and characteristics of electromagnetic type over-current, differential, impedance and admittance relays. Detail of protection against abnormal conditions for alternators, transformers, feeders transmission lines, and bus-bars. Carrier current protection for long lines.

**Unit-V**

**Static Relays:** Introduction, comparison with electromagnetic relays, working of instantaneous, definite time, inverse time and directional over current relays, introduction to digital relays.

**List of Experiments:**

Operating Characteristics of

1. Over Voltage Relays
2. IDMT Relays
3. Percentage based differential relays
4. Buchholz relays .
5. Solid state over current relays

**References:**

1. Sunil S. Rao , Switchgear and protection.
2. Badraram & Vishwakarma, Power System Protection

**Textbooks:**

1. IJ Nagrath and DP Kothari, "Power System Engineering" Tata McGraw-Hill.
2. CL Wadhwa, "Electric Power Systems", Wiley Eastern Limited.

**B.Tech. (Electrical Engineering)**  
**V Semester**  
**SIMULATION LAB**

**LIST OF EXPERIMENT**

1. Study of MATLAB and its Application.
2. To generate the sinusoidal and co sinusoidal pulse with the help of MATLAB.
3. To find the time response for series RLC circuit.
4. To plot output waveform of MOSFET.
5. To generate the pulse with the help of PWM techniques.
6. To Analyze the operation of single phase half wave rectifier supply resistive, inductive loads.
7. To model and simulate the single phase full wave controlled bridge rectifier fed separately excited DC motor by using MATLAB/SIMULINK.
8. To observe the waveform of single phase semi convertor circuit with RL load.
9. To observe the waveform of ASK, FSK and PSK using MATLAB.
10. To observe the waveform of Clipper and Clamper Circuit
11. To observe the waveform of single phase half wave AC VOLTAGE CONTROLLER
12. To observe the load current ,voltage and speed waveform of Asynchronous Machine
13. To observe the waveform of single phase full wave rectifier circuit with R load
14. To observe the waveform of single phase half wave thyristor circuit with R load
15. To observe the waveform of single phase semi convertor circuit, when one of the thyristor is replaced by diode

**REFERNCES :-**

1. Shailandra Jain, Modeling and simulation using MATLAB/SIMULINK ,willey
2. I.J.Nagrath,D.P. Kothari, Electrical machine, TMH
3. P.C. Sen ,Power Electronics, TMH

## SSD- CPP (Campus Placement Program)

### 5th Semester

**B.Tech (Engg.)/B.Tech (Ag.)/B.Tech (BT)/B.Sc.(Hons) Ag/B.Sc (BT)/B.Pharm/BBA/B.Com/B.com(Hons)/BCA(Hons)/Diploma (Engg.)**

**Introduction to CPP Program:** 'Soft skills' are a framework of desirable qualities which gives a candidate an edge over his peers during the selection process of a company. We, at AKS University, have designed the Campus Placement Program (CPP) to help out our students who are sitting for their placement process in various Companies.

#### **Objective of The Program:**

- ❖ Develop effective communication and Presentation skills.
- ❖ Develop all-round personality with a mature outlook to function effectively in different circumstances.
- ❖ Take part effectively in various selection procedures adopted by the recruiters.
- ❖ Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.

#### **UNIT-1**

Talking about Present, Past and Future, Describing Processes and operations, Expressing Opinion: Agreement & Disagreement, Pronunciation and neutral accent, Group Discussion: Concept and Practice, Resume Writing.

#### **UNIT-2**

**Public Speaking:** A presentation about the company will be made by the students throughout the Unit. Each and every student is required to go through at least 10 Companies Profile related to their domain expertise. Basically the presentation includes the information like selection procedure, company's milestones, organizational achievements, candidate scope of improvement within the organization if selected, salary, employment benefits. Usually this presentation will end up with question and answer session, students given chance to ask questions about company.

#### **UNIT-3**

**Mastering Personal Interviews:** Paper Interview, Personal Interview, FAQs, Interview Practice, Domain Specific Interview Preparation, Peer review- Pair interview, Interview model (Vocabulary for an effective Interview).

#### **UNIT-4**

**Communication Skills and Reading Comprehension Test Preparation:** Interpersonal Communication Assignment, Sentence Fluency Assignment, A way with words Assignment, Vocabulary Assignment, Communication skills placement paper Test, Reading Comprehension Assignment, Communication Assignment: Presentation Skills and Group discussion.

**B.Tech (Electrical Engg.)**  
**Semester-VI**  
**ELECTRICAL DRIVES**

**UNIT-I**

Introduction- Classifications of Electric Drives, components of electric drives, advantages of electric drives, Review of characteristics and speed control of d.c. and a.c. motors. Dynamics of Electric Drives:- Fundamental torque equation, speed-torque conventions and multi-quadrant operation, equivalent values of drive parameters, components of load torques, nature and classification of load torques, calculation of time and energy-loss in transient operations, criteria for steady state stability, load equalization.

**UNIT-II**

Rating and Heating of Motors- Thermal model of motor for heating and cooling, classes of motor duty, determination of motor rating, frequency of operation of motors subjected to intermittent loads.

**UNIT-III**

Rectifier Control of D.C. Drives- Controlled rectifier circuits, 1-phase fully controlled rectifier-fed separately excited d.c. motor, 3-phase fully controlled rectifier-fed separately excited d.c. motor, multi-quadrant operation of fully-controlled rectifier-fed d.c. motor. Chopper Control of D.C. Drives- Principle of operation and control techniques, motoring operation of separately excited and series excited motors, multi-quadrant control of chopper-fed motors.

**UNIT-IV**

Induction Motor (IM) Drives:- 3-phase a.c. voltage controller-fed IM drive, voltage source inverter (VSI) and current source inverter (CSI) variable frequency drives, comparison of VSI and CSI drives, cyclo-converter-fed IM drive, static rotor resistance control of 3-phase slipring IM.

**UNIT-V**

Synchronous Motor Drives- VSI drive, CSI drive, CSI drive with load commutation, cyclo-converter drive, Braking methods- Various methods of braking d.c. and a.c. motors, regenerative braking of d.c. motors during chopper control, static Scherbius drive, commutatorless Kramer drive. Introduction to Microprocessor Control of Electric Drives.

**Reference Books:**

1. V. Subrahmanyam, "Electric Drives: Concepts and Applications", Tata Mc Graw Hill Publishing. 2. G.K. Dubey, "Power Semiconductor Controlled Drives", Prentice Hall, Englewood cliff.

**Text Book:**

1. G.K. Dubey, "Fundamentals of Electrical Drives" Narosa Publishing House.  
2. P. C. Sen, "Thyristor dc Drives", Wiley International.

**List of Experiments:**

1. Study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge converter.
2. Study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. Study speed control of separately excited dc motor using single phase dual converter (Static Ward- Leonard Control)
4. Study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. Study closed loop control of separately excited dc motor
6. Study speed control of single phase induction motor using single phase ac voltage controller.
7. Study speed control of three phase induction motor using three phase ac voltage controller.
8. Study speed control of three phase induction motor using three phase current source inverter
9. Study speed control of three phase induction motor using three phase voltage source inverter.
10. Study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper

**B.Tech (Electrical Engg.)**  
**Semester-VI**  
**ELECTRICAL MACHINE DESIGN**

**UNIT-I**

Review of Magnetic and insulating materials.Principles of design of Machines: Factors and limitations in design, specific magnetic and electric loadings, output, real and apparent flux densities, separation of main dimensions for D.C., induction and synchronous machines.

**UNIT-II**

Heating, Cooling and Ventilation: Temperature rise calculation, continuous, short- time and intermittent ratings, types of ventilation, hydrogen cooling and its advantages.

**UNIT-III**

Design of Transformers: General considerations, output equation, main dimensions, leakage reactance, winding design, tank and cooling tubes, calculation of magnetizing current, losses, efficiency and regulation.

**UNIT-IV**

Design Three-phase induction motors: General considerations, output equation, choice of specific electric and magnetic loadings, No. of slots in stator and rotor, elimination of harmonic torques, design of stator and rotor windings, leakage reactance, equivalent resistance of squirrel cage rotor, magnetizing current, temperature rise and efficiency.

**UNIT-V**

Design of Alternators: Classification and their comparison, specific loadings, output coefficient, main dimensions, short circuit ratio, elimination of harmonics in generated EMF, stator winding design. Introduction to computer aided electrical machine design.

**Reference Books:**

1. Clayton A.E., “The performance and design of D.C. Machines”.
2. Say MG, “The performance and design of A.C. Machines”.

**Text Book:**

1. Sawhney AK, “Electrical Machine Design”, Dhanpat Rai & Sons.

**B.Tech (Electrical Engg.)**  
**Semester-VI**  
**LINEAR CONTROL SYSTEM**

**UNIT-I**

Introduction to Control Systems- Concept of control, control system terminology, classification of Control Systems. Mathematical Models of Systems- Differential equations of physical systems, transfer function of linear systems, block diagram models, signal flow graph. D.C. & A.C. Servomotors, Synchronos.

**UNIT-II**

State Variable Models- State variables of a dynamic system, state equation, transfer function from the state equation and vice-versa.

Feedback Control System Characteristics- Time domain and frequency domain responses and characteristics, steady state error, performance indices, concept of stability.

**UNIT-III**

Analysis of Linear Feedback Systems- R-H stability criterion, Nyquist criterion, Bode plot, Root locus and Lyapunov's criterion.

**UNIT-IV**

Design of Feedback Control System-Approaches to system design, phase lead, phase lag design using Bode-diagram and root locus techniques

**UNIT-V**

Design using State variable Feedback- Controllability, observability, pole placement using state feedback, Ackerman's formula, limitations of state variable feedback. Introduction to P/I/D and ON-OFF control actions.

**Reference Books:**

1. I.J.Nagrath and M.Gopal, "Control System Engg", TMH.
2. M.Gopal, "Control Systems Principles and Design", TMH.

**Text Book:**

1. K. Ogata, "Modern Control Engineering", PHI.

**List of Experiments:**

1. Study time response of second order system.
2. To study characteristics of Synchronos.
3. To study effect of feedback on servomotors.
4. Determination of transfer function of A-C servomotor
5. Determination of transfer function of D-C motor.
6. Formulation of PI & PD controller and study of closed loop responses of 1st and 2nd order dynamic systems.



**B.Tech (Electrical Engg.)**  
**Semester-VI**  
**MICROPROCESSOR AND MICROCONTROLLER**

**UNIT-I**

Microprocessor Architecture-8085 microprocessor architecture, timing and control unit, machine cycles, interrupt diagram. Architecture of 8086 microprocessor

**UNIT-II**

Programming- Addressing modes, instruction set, assembly language programming, program for multi byte addition/subtraction, multiplication, division, block transfer.

**UNIT-III**

Interfacing- Basic principles of interfacing memory and I /O devices. Data transfer techniques – programmed interrupt and DMA. Details of interfacing devices 8255 and 8253. Interfacing of D/A and A/D converter.

**UNIT-IV**

Semi Conductor Memory- Read only memories, random access memories. Interfacing of memories with 8085/86.

**UNIT-V**

Microcontroller- Architecture of 8051 microcontroller. Interrupt, serial and timer control. Instruction set and programming. Interfacing with D/A and A/D converter. Applications of microprocessors and microcontrollers.

**Reference Books:**

1. R.S. Gaonkar, “Microprocessor Architecture, Programming and Applications.
2. K.J. Ayala, “8051 Microcontroller”, Penram International.

**Text Book:**

- 1.Ray A.K., Bhurchandi K.M. "Advance Microprocessor and peripheral", first edition, TMH.

**List of Experiment:**

- 1.Familiarization with 8085/86 Microprocessor and 8051 Microcontroller kit.
- 2.Write program for display of 24 hour clock on 8085 mp kit.
- 3.To generate square wave, saw tooth, triangular wave of 1KHz frequency and 50% duty cycle using 8051 kit.
- 4.To develop and run a program for arranging in ascending/descending order of a set of numbers
- 5.To obtain interfacing of keyboard and DMA controller
- 6.To perform microprocessor based traffic light control operation through 8085 kit

**B.Tech (Electrical Engg.)**  
**Semester-VI**  
**SIGNAL AND SYSTEM**

**UNIT-I**

Dynamic Representation of Systems: Systems Attributes, Causality linearity, Stability, time invariance. Special Signals, Complex exponentials, Singularity functions (impulse and step functions). Linear Time-Invariant Systems: Differential equation representation convolution Integral. Discrete form of special functions. Discrete convolution and its properties. Realization of LTI system (differential and difference equations).

**UNIT-II**

Fourier Analysis of Continuous Time Signals and Systems : Fourier Series, Fourier Transform and properties, Parseval's theorem, Frequency response of LTI systems. Sampling Theorem.

**UNIT-III**

Fourier Analysis of Discrete Time Signals & Systems : Discrete-Time Fourier series, Discrete-Time Fourier Transform (including DFT) and properties. Frequency response of discrete time LTI systems.

**UNIT-IV**

Laplace Transform: Laplace Transform and its inverse: Definition, existence conditions, Region of Convergence and properties, Application of Laplace transform for the analysis of continuous time LTI system (stability etc.) Significance of poles & zeros.

**UNIT-V**

Z-Transform : Z-Transform and its inverse: Definition, existence, Region of convergence and properties, Application of Z-Transform for the analysis of Discrete time LTI Systems, Significance of poles and zeros.

**Reference Books:**

1. Simon Haykin, Communication Systems, 3rd Edition, John Wiley.
2. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall.

**B.Tech (Electrical Engg.)**  
**Semester-VII**  
**ENERGY CONSERVATION AND MANAGEMENT**

**UNIT-I**

Energy Review of various energy sources, Need of energy conservation and energy audit.

**UNIT-II**

Energy Conservation: Lighting energy: methods/Techniques of efficient lighting.Heating: methods/Techniques of energy Saving in Furnaces, Ovens and Boilers.Cooling: methods/Techniques of Energy Saving in Ventilating systems and Air Conditioners Motive power, Energy Efficient Motors, and Efficient use of energy in motors with the help of voltage reducers, automatic star/ delta converters . Power factor improvement devices and soft starters/Variable Frequency Drives. Amorphous Core Transformers Cogeneration -Types and Advantages.

**UNIT-III**

Tariff and Energy Conservation in Industries: Energy cost and Recent MSEB tariffs, Application of Tariff System to reduce Energy bill, Energy Conservation by improving load factor and power factor.

Energy Conservation In Transmission and Distribution Systems: Reactive power compensation, demand side management, system voltage optimization and phase current balancing, Losses in transmission and distribution system and its minimization

**UNIT-IV**

Energy and the Environment: Environment and social concerns related to energy utilization, The green house effect, Global Warming and its effect , Pollution, Acid Rains, Global Energy and environment Management.

**UNIT-V**

Energy Audit: Procedure of Energy audit, ABC analysis, Energy Flow Diagram and its importance, Measurements in energy audit and various measuring instruments, Questionnaires for the energy audit, internal energy audit checklist, Equipment used for energy conservation, Calculation of payback period for energy conservation equipment. IE rules and regulations for energy audit, Electricity act 2003 ( Numerical).

**Reference Books:**

- 1.C.L. Wadhawa Generation Distribution and Utilization of Electrical Energy New Age 2004.
- 2.Electrical Energy Utilization & Conservation. Dr. Tripathi S.Chand.

**Text Books:**

1. Energy Management – W.R. Murphy & G. Mckey Butler worths.
2. Energy Management Head Book- W.C. Turner, John Wiley.

**B.Tech (Electrical Engg.)**  
**Semester-VII**  
**POWER SYSTEM ANALYSIS AND CONTROL**

**UNIT-I**

Representation of Power System Components- Synchronous machines, Transformers, Transmission lines, one line diagram, Impedance and reactance diagram, per unit System.

**UNIT-II**

Symmetrical components- Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Symmetrical fault analysis- Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions.

**UNIT-III**

Unsymmetrical faults -Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance. Formation of Z bus using singular transformation and algorithm, computer method for short circuit calculations.

**UNIT-IV**

Load Flow- Introduction, bus classifications, nodal admittance matrix (Y BUS ), development of load flow equations, load flow solution using Gauss Siedel and Newton Raphson method, approximation to N-R method, line flow equations and fast decoupled method.

**UNIT-V**

Power System Stability- Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by- step method. Factors affecting steady state and transient stability and methods of improvement.

Power Control- Concept of Load frequency control, Concept of voltage and reactive power control.

**Reference Books:**

1. W.D. Stevenson, Jr. "Elements of Power System Analysis", McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.

**Text Books:**

1. Kothari & Nagrath, "Modern Power System Analysis" Tata McGraw Hill.
2. L. P. Singh; "Advanced Power System Analysis & Dynamics", New Age International.

**List of Experiments:**

1. To determine direct and sub transient axis reactance ( $x_d$ ) and quadrature axis reactance ( $x_q$ ) of a salient pole alternator.
2. To determine negative and zero sequence reactance of an alternator.
3. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation.
4. To study the IDMT over current relay and determine the time current characteristics.
5. To study percentage differential relay, Impedance, MHO and Reactance type distance relays.
6. To study Ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
7. To obtain formation of Y-bus and perform load flow analysis using Gauss-Siedel method.
8. To perform symmetrical and unsymmetrical fault analysis in a power system.

**B.Tech (Electrical Engg.)**  
**Semester-VII**  
**UTILIZATION OF ELECTRICAL POWER**

**UNIT-I**

Illumination- Nature of light, important definitions, laws of illumination, principle of production of light- discharge through gases under pressure – incandescence/sources of light-filament lamp, halogen lamp-discharge lamp-sodium discharge lamp,high pressure mercury discharge lamp, dual lamps, fluorescent lamps, lamp efficiency,requirements of good lighting, illumination level, absence of contrasts, shadows, glare, colour rendering-lamp fittings. Lighting schemes,design of indoor & outdoor lighting system-street lighting,flood lighting, photometers.

**UNIT-II**

Electric Heating- Advantages of electric heating, classification of heating methods, detailed study of resistance heating, arc heating, electron bombardment heating, induction heating & dielectric heating and their control.

**UNIT-III**

Electrolytic Processes- Fundamentals of electro deposition-laws of electrolysis applications of electrolysis, electro deposition, manufacture of chemicals, anodizing, electro- polishing, electro-cleaning, electro-parting, electrometallurgy, electric supply.

**UNIT-IV**

Train Mechanics- Types of services, characteristics of each type of service, speed time curve, simplified speed time curve, average speed, schedule speed, factors affecting schedule speed, tractive effort for propelling a train, power of the traction motor, specific energy output, specific energy consumption, factors affecting specific energy consumption, mechanics of train movement, coefficient of adhesion, factors affecting slip.

**UNIT-V**

Electric Traction- D.C. & A.C. traction motors, their characteristics Traction Motor Control: Starting and speed control of D.C. series motors, shunt transition, bridge transition, drum controller employing shunt transition, energy saving with series parallel starting, metadyne control, multiple unit control, braking of traction motor.Current Collection Systems- Conductor rail equipment, current collection gear for OHE: Cable collector, pole collector, bow collector, pantograph collector.

**Reference Books:**

1. H. Partap, “Art & Science of Utilization of Electrical Energy”.
2. N.V. Suryanarayana, “Utilization of Electric Power”.

**Text Books:**

1. BR Sharma, “Utilization of Electrical. Energy”.
2. P.V. Gupta, “A Course in Electrical Power”, Dhanpat Rai & Sons Delhi.

**B.Tech (Electrical Engg.)**  
**Semester-VII**  
**MAJOR PROJECT (PLANNING AND LITERATURE SURVEY)**

The object of Project Work I is to enable the student to take up investigative study in the broad field of Electrical Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the students in R&D work. The assignment to normally include: Survey and study of published literature on the assigned topic; Working out a preliminary Approach to the Problem relating to the assigned topic; Conducting preliminary Analysis/ Modelling/ Simulation/ Experiment/ Design/ Feasibility; Preparing a Written Report on the Study conducted for presentation to the Department; Final Seminar, as oral Presentation before a Departmental Committee.

**B.Tech (Electrical Engg.)**  
**Semester-VIII**  
**COMPUTER AIDED MACHINE DESIGN**

**UNIT-I**

Introduction to computer aided tools for analysis and design- software and hardware PSPICE /PSIM / MATLAB-SIMULINK/ MATHEMATICA/ 20SIM / LABVIEW / DSPACE (description as per choice/ availability)

**UNIT-II**

Modelling of Electrical/Electronic components and systems, Time and Frequency domain analysis, parameter variations, response representation storage/import/export.

**UNIT-III**

Optimization methods: parametric optimization and functional optimization. Design issues of Electrical/Electronic components and systems.

**UNIT-IV**

Applications for control systems, power systems and electrical machines.

**Reference Books:**

1. Paul W. Tuinenga, "SPICE : A guide to circuit Simulation and Analysis Using PSPICE", Prentice Hall.
2. M.H. Rashid, "SPICE for Circuits and Electronics Using PSPICE" Prentice Hall of India.

**Text Books:**

1. L.P.Singh, „Advanced Power System Analysis and Dynamics“, New Age International.
2. M.Gopal, „Control Systems: Principles and Design“, TMH.

**B.Tech (Electrical Engg.)**  
**Semester-VIII**  
**POWER SYSTEM PLANNING AND RELIABILITY**

**UNIT-I**

Review of Probability Theory Element of probability theory Probability Distribution, Random variable, Density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distributions, Normal distribution, Exponential distribution, Weibull distribution.

**UNIT-II**

Reliability of Engineering Systems Component reliability, Hazard models, Reliability of systems with non-repairable components, series, Parallel ,Parallel-series configurations. Non-series-parallel configurations, minimal tie-set, minimal cut-set and decomposition methods. Repairable systems, MARKOV process, Long term reliability, Power System reliability.

**UNIT-III**

Reliability of Engineering Systems Reliability model of a generating unit, State space methods, Combing states, sequential addition method, Load modeling, Cumulative load model, merging of generation and load models, Loss of load probability, Percentage energy loss, Probability and frequency of failure, Operating reserve calculations.

**UNIT-IV**

Power Network Reliability Weather effect on transmission lines, Common mode failures, Switching after faults , state components, Normally open paths, Distribution system reliability.

**UNIT-V**

Composite System Reliability Bulk Power supply systems, Effect of varying load, Inter connected systems, correlated and uncorrelated load models, Cost and worth of reliability.

**References:**

- 1.J. Endreny, Reliability Modeling in Electric Power Systems, John Wiley & Sons.
- 2.Roy Billinton & Ronald, N allan, Reliability Evaluation of Power Systems, Plenum Press, New York.



**B.Tech (Electrical Engg.)**  
**Semester-VIII**  
**MAJOR PROJECT**

The object of Project Work is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the students in R&D work and technical leadership. The assignment to normally include: In depth study of the topic assigned in the light of the Report prepared ; Review and finalization of the Approach to the Problem relating to the assigned topic; Preparing an Action Plan for conducting the investigation, including team work; Detailed Analysis/ Modelling/ Simulation/ Design/ Problem Solving/ Experiment as needed; Final development of product/process, testing, results, conclusions and future directions; Preparing a paper for Conference presentation/Publication in Journals, if possible; Preparing a Dissertation in the standard format for being evaluated by the Department; Final Seminar Presentation before a Departmental Committee.

**B.Tech (Electrical Engg.)**  
**Semester-VIII**  
**MODELLING AND SIMULATION LAB**

1. Study of various Electrical Toolbox i.e. Power System, Power Electronics, Control system, Electrical Measurement ,Flexible AC Transmission.
2. Developing Simulation Models for single and three phase Rectifier, Inverter, and Converter for different load models.
3. Developing Simulation Models using FACTS Devices i.e. STATCOM, SVC, TCSC,SSSC, IPFC ,UPFC in power system transmission lines.

**Reference Book:**

1. Shailendra Jain "Modeling and Simulation using MATLAB Simulink" wiley india & sons

## **ELECTIVE SUBJECTS**

**B.Tech (Electrical Engg.)**

**Elective-1(A)**

### **PLANNING FOR SUSTAINABLE DEVELOPMENT**

#### **UNIT-I**

Introduction of Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

#### **UNIT-II**

Innovation for sustainable development- Environmental management and innovation strategies.

#### **UNIT-III**

Societal transformations. Institutional theory.

#### **UNIT-IV**

Governance for sustainable development. policy responses to environmental degradation.

#### **UNIT-V**

Capacity development for innovation. research methods.

#### **Text/Reference Books:**

1.Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper Available at:

[http://ase.tufts.edu/gdae/publications/Working\\_Papers/Sustainable%20Development.PDF](http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF)

2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics.

3. Hjorth, P. and A. Bagheri (2006) Navigating towards Sustainable Development: A System Dynamics Approach, Futures.

**B.Tech (Electrical Engg.)**  
**Elective-1(B)**  
**SCADA SYSTEM & APPLICATION**

**Unit I**

Introduction to SCADA and PLC SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

**Unit II**

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

**Unit III**

SCADA Architecture-Variou SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

**Unit IV**

SCADA Communication-Variou industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

**Unit V**

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation, SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

**Reference Books:**

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.

**B.Tech (Electrical Engg.)**  
**Elective-1(C)**  
**FACTS**

**UNIT-I**

**Introduction to FACTS controllers** – Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation, principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

**UNIT II**

**Thyristor Controlled Shunt Compensator:** Objective of shunt compensation- Principle and operating characteristics of Thyristor Controlled Reactor(TCR)-Thyristor Switched Capacitor(TSC)- Static VAR Compensators (SVC)- SVC control system- SVC voltage regulator model-Transfer function and dynamic performance of SVC- Transient stability enhancement and power oscillation damping, mitigation of sub-synchronous resonance.

**UNIT III:**

**Thyristor Controlled Series Compensator (TCSC) :**Series compensation – Principles of operation of TCSC- Capability characteristics of TCSC- Modeling of TCSC- TCSC control system- enhancement of system damping -mitigation of sub-synchronous resonance.

**UNIT IV**

**VSC Based Shunt and Series Compensator:** Static Synchronous Compensator (STATCOM): Principle of operation, VI Characteristics, Harmonic performance – Steady state model – SSR mitigation. Static Synchronous Series Compensator (SSSC): Principle of operation and characteristics of SSSC – control range and VA rating – capability to provide real power compensation – Immunity to sub-synchronous resonance – control scheme for SSSC.

**UNIT V:**

**Unified Power Flow Controller :**Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

**Reference Books:**

1. K. R. Padiyar, “HVDC Power Transmission Systems Technology and System Interactions”, New Age International (p) Limited, New Delhi, 2003.
2. Gyugyi L, “Unified Power flow control concept for flexible AC transmission”, IEEE Proceedings, vol. 139, no. 4, July 1992.

**Text Books:**

1. Narain G. Hingorani and Laszlo Gyugyi, “Understanding FACTS concepts and technology of flexible AC transmission systems” Edition 2001, IEEE power Engineering society Sponsor, IEEE press, 2001.
2. R. Mohan Mathur and Rajiv K. Varma, “Thyristor-Based FACTS Controllers for Electrical Transmission Systems”, Edition February 2002, IEEE press-John Wiley and Sons publications, 2002.

**B.Tech (Electrical Engg.)**  
**Elective-2(A)**  
**HIGH VOLTAGE ENGINEERING**

**UNIT-I**

Conduction & Breakdown in Gases, Liquid & Solid Dielectrics: Gases -Ionization process, Townsend's current growth equation. 1st & 2nd ionisation coefficients. Townsend criterion for breakdown. Streamer theory of breakdown. Paschen's law of gases. Gases used in practice.

**UNIT-II**

Liquid Dielectrics-Conduction & breakdown in pure & commercial liquids, suspended particle theory, stressed oil volume theory, liquid dielectrics used in practice; Solid Dielectrics-Intrinsic, electromechanical, & thermal breakdown, composite dielectric, solid dielectrics used in practice; Applications of Insulating Materials: Application of insulating materials in power transformers, rotating machines, circuit breakers, cables & power capacitors.

**UNIT-III**

Generation of High Voltages & Currents: Generation of high D.C., A.C., impulse voltage & impulse currents. Tripping & control of impulse generators; Measurement of High Voltages & Currents: Measurement of high D.C., A.C. (Power frequency & high frequency) voltages, various types of potential dividers, generating voltmeter, peak reading A.C. voltmeter, Digital peak voltmeter, electrostatic voltmeter. Sphere gap method, factors influencing the spark voltage of sphere gaps.

**UNIT-IV**

High Voltage Testing of Electrical Apparatus: Testing of insulators, bushings, circuit breakers power capacitors & power transformers.

**UNIT-V**

Over voltage Phenomenon & Insulation Co-ordination: Theory of physics of lightning flashes & strokes. Insulation co-ordination, volt-time and circuit time characteristics. Boys camera, standard voltage & current shapes produced in Lab., Horn gap, single diverters, ground wires, surge absorbers.

**Reference books:**

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, Tata Mc-Graw Hill.
2. M. P. Chaurasia, "High Voltage Engineering", Khanna Publishers

**Text books:**

1. R. S. Jha, "High Voltage Engineering", Dhanpat Rai & sons
2. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.

**B.Tech (Electrical Engg.)**  
**Elective-2(B)**  
**GENERALISED THEORY OF MACHINES**

**UNIT-I**

Review: Primitive machine, voltage and torque equation. Concept of transformation, change of variables, m/c variables and transform variables. Application to D.C. machine for steady state and transient analysis, equation of cross field commutator machine.

**UNIT-II**

Induction Machine: Voltage, torque equation for steady state operation, Equivalent circuit, Dynamic performance during sudden changes in load torque and three phase fault at the machine terminals. Voltage & torque equation for steady state operation of 1- $\phi$  induction motor & scharge motor.

**UNIT-III**

Synchronous Machine: Transformation equations for rotating three phase windings, Voltage and power equation for salient and non salient alternator, their phasor diagrams, Simplified equations of a synchronous machine with two damper coils.

**UNIT-IV**

Operational Impedances and Time Constants of Synchronous Machines : Park's equations in operational form, operational impedances and G(P) for a synchronous machine with four Rotor Windings, Standard synchronous machine Reactances, time constants, Derived synchronous machine time constants, parameters from short circuit characteristics.

**UNIT-V**

Approximate Methods for Generator & System Analysis: The problem of power system analysis, Equivalent circuit & vector diagrams for approximate calculations, Analysis of line to line short circuit, Application of approximate method to power system analysis.

**Reference Books:**

1. The General theory of Electrical Machines - B.Adkins
2. The General theory of AC Machines - B.Adkins & R.G.Harley
3. Generalised theory of Electrical m/c - P.S.Bhimbra

**B.Tech (Electrical Engg.)**  
**Elective-3(A)**  
**EHVAC & DC TRANSMISSION**

**UNIT-I**

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.

**UNIT-II**

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

**UNIT-III**

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.

**Unit-IV**

Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

**Unit-V**

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lightning and switching over voltages

**Reference books:**

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" jodhn willy & sons pub.

**Text books:**

- 1 Padiyar, -"HVDC Transmission" 1 t Edition ,New age international pub
- 2.Narain.G. Hingorani, I. Gyugyi-"Undustanding of FACTS concept and technology", John Wiley & sons
3. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.



**B.Tech (Electrical Engg.)**  
**Elective-3(B)**  
**ADVANCE CONTROL SYSTEM**

**UNIT-I**

State Space Analysis of Continuous System: 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

**UNIT-II**

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

**UNIT-III**

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

**UNIT-IV**

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.

**UNIT-V**

Optimal Control: Introduction, formation of optimal control problem, Adaptive Control: Introduction, modal reference adaptive control systems, controller structure, self tuning regulators. Introduction to neural network, fuzzy logic and genetic algorithms

**Reference Books:**

1. B.C. Kuo, "Digital Control Systems" Sounders College Publishing

**Text books:**

1. Ajit K.Madal, "Introduction to Control Engineering: Modeling, Analysis and Design" New Age International.
2. D.Landau, "Adaptive Control", Marcel Dekker Inc.
3. S.Rajasekaran & G.A.Vjayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Alogorithms: Synthesis and Applications" Prentice Hall of India

**B.Tech (Electrical Engg.)**  
**Elective-4(A)**  
**ADVANCE POWER ELECTRONICS**

**UNIT-I**

D.C. to D.C. Converter: Classification of choppers. Principle of operation, steady state analysis of class A chopper, step up chopper, switching mode regulators: Buck, Boost, Buck-Boost, Cuk regulators. Current commutated and voltage commutated chopper.

**UNIT-II**

A.C. to A.C. Converter: Classification, principle of operation of step up and step down cycloconverter. Single phase to single phase cycloconverter with resistive and inductive load. Three phase to single phase cyclo converter: Half wave and full wave. Cosine wave crossing technique. Three phase to three phase cyclo converter. Output voltage equation of cyclo converter.

**UNIT-III**

D.C. to A.C. Converter: Classification, basic series and improved series inverter, parallel inverter, single phase voltage source inverter, steady state analysis, Half bridge and full bridge inverter: Modified Mc Murray and Modified Mc Murray Bedford inverter, voltage control in single phase inverters, PWM inverter, reduction of harmonics, current source inverter, three phase bridge inverter.

**UNIT-IV**

Power Supplies: Switched mode D.C. and A.C. power supplies. Resonant D.C. and A.C. power supplies.

**UNIT-V**

Applications: Dielectric and induction heating. Block diagram of D.C. and A.C. motor speed control.

**Reference Books:**

1. Jacob, Michael Power Electronics: Principles & Application, Vikas Publishing House
2. M.H. Rashid, Power Electronics : Circuits, devices and applications , PHI.

**Text books:**

1. P.S. Bimbhra, „Power Electronics“ , Khanna Publishers.
2. M.D. Singh and K.B. Khanchandani, Power Electronics, Tata McGraw-Hill.
3. A.K. Gupta & L.P. Singh, Engineering Risk–Benefit Analysis

**B.Tech (Electrical Engg.)**  
**Elective-4(B)**  
**ENGINEERING RISK BENEFIT ANALYSIS**

**UNIT-I**

Introduction- Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model

**UNIT-II**

System Definition and Structure: System Definition Models, Hierarchical Definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems.

**UNIT-III**

Consequence Assessment-Types, Cause-Consequence Diagrams, Microeconomic Modelling, Value of Human Life, Flood Damages, Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence.

**UNIT-IV**

Decision Analysis: Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models.

**UNIT-V**

Data Needs for Risk Studies: Elicitation Methods of Expert Opinions, Guidance.

**Reference Books:**

1. Probability, Statistics, and Reliability for Engineers and Scientists, Ayyub & McCuen, 2003.
2. Probabilistic Risk Assessment and Management for Engineers and Scientists, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.

**Text Books:**

1. Risk Analysis in Engineering and Economics, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.