B.TECH. ELECTRICAL AND ELECTRONICS ENGG. (3rd SEMESTER)

TOTAL CONTACT HRS. = 28, TOTAL CREDITS = 23

Code	Name	L	T	P	Int.	Ext.	Total	
BMAT0-F91	Mathematics-III	3	1	0	40	60	100	4
BEEE1-301	Circuit Theory	3	1	0	40	60	100	4
BEEE1-302	Electrical Measurement & Instrumentation	3	1	0	40	60	100	4
BEEE1-303	Electrical Machines-I	3	1	0	40	60	100	4
BEEE1-304	Electronic Devices and Circuits	3	1	0	40	60	100	4
BEEE1-305	Electrical Measurement & Instrumentation Laboratory	0	0	2	60	40	100	1
BEEE1-306	Electrical Machines-I Laboratory	0	0	2	60	40	100	1
BEEE1-307	Electronic Devices and Circuits Laboratory	0	0	2	60	40	100	1
BPRS0-F91	Professional skills-I	0	0	2	60	40	100	1
BEEE1-308	Training-I	-	-	-	60	40	100	2
Total 5 Theory & 4 Lab. Courses		**15**	**5**	**08**	**500**	**500**	**1000**	**26**

B.TECH. ELECTRICAL AND ELECTRONICS ENGG. (4TH SEMESTER)

TOTAL CONTACT HRS. = 26, TOTAL CREDITS = 23

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1-409	Electrical Machines-II	3	1	0	40	60	100	4
BEEE1-410	Linear Control System	3	1	0	40	60	100	4
BEEE1-411	Digital Electronics	3	1	0	40	60	100	4
BEEE1-412	Power System-I	3	1	0	40	60	100	4
BEEE1-413	Electromagnetic Field Theory	3	1	0	40	60	100	4
BEEE1-414	Linear Control System Laboratory	0	0	2	60	40	100	1
BEEE1-415	Digital Electronics Laboratory	0	0	2	60	40	100	1
BPRS0-F92	Professional skills- II	0	0	2	60	40	100	1
Total 5 Theory & 3 Lab. Courses		**15**	**5**	**6**	**380**	**420**	**800**	**23**

B.TECH. ELECTRICAL AND ELECTRONICS ENGG. (5TH SEMESTER)

TOTAL CONTACT HRS. = 23, TOTAL CREDITS = 23

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1-516	Signals & Systems	3	1	0	40	60	100	4
BEEE1-517	Power Electronics & Utilization	3	1	0	40	60	100	4
BEEE1-518	Microprocessors	3	1	0	40	60	100	4
BEEE1-51XX	**Open Elective-I**	3	0	0	40	60	100	3
Departmental Elective-I (Choose any one)		3	1	0	40	60	100	4
BEEE1-556	Sensors & Transducers							
BEEE1-556	Electrical Engineering Materials							
BEEE1-556	Power Generation System							
BEEE1-556	Modern Optimization Techniques							
BEEE1-519	Microprocessors Lab	0	0	2	60	40	100	1
BPRS0-F93	Professional Skill-III	0	0	2	60	40	100	1
BEEE1-520	Training-II	--	-	--	60	40	100	2
Total 5 Theory & 2 Lab. Courses		**15**	**4**	**04**	**380**	**420**	**800**	**23**

B.TECH. ELECTRICAL AND ELECTRONICS ENGG. (6TH SEMESTER)

TOTAL CONTACT HRS. = 25, TOTAL CREDITS = 22

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1-621	Non Linear & Digital Control Systems	3	1	0	40	60	100	4
BEEE1-622	Power System-II	3	1	0	40	60	100	4
Departmental Elective-II		3	1	0	40	60	100	4
BEEE1-660	Fuzzy logic & Neural Networks							
BEEE1-661	VLSI Design							
BEEE1-662	Energy auditing & Management							
BEEE1-663	Microcontroller & PLC							
Departmental Elective-III		3	1	0	40	60	100	4
BEEE-664	Digital Signal Processing							
BEEE-665	Remote control & Telemetry							
BEEE-666	Non-Conventional Energy Resources							
BEEE-667	Artificial Intelligent Systems							
BEEE-162XX	**Open Elective-II**	3	0	0	40	60	100	3
BEEE1-623	Power System-II Lab	0	0	2	60	40	100	1
BEEE1-624	Power Electronics Lab	0	0	2	60	40	100	1
BPRS0-F94	Professional Skills -IV	0	0	2	60	40	100	1
Total 5 Theory & 5 Lab. Courses		**15**	**4**	**6**	**380**	**420**	**800**	**22**

B.TECH. ELECTRICAL AND ELECTRONICS ENGG. (7TH SEMESTER)

TOTAL CONTACT HRS. = 19, TOTAL CREDITS = 25

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1-725	Computer Applications in Power System Analysis	3	1	0	40	60	100	4
BEEE1-726	Communication System	3	1	0	40	60	100	4
BEEE1-73XX	**Open Elective-III**	3	0	0	40	60	100	3
Departmental Elective-IV		3	1	0	40	60	100	4
BEEE1-768	Telemetry & SCADA System							
BEEE1-769	Image Processing							
BEEE1-770	High Voltage Engineering							
BEEE1-771	HVDC & EHVAC Systems							
BEEE1-727	Computer Applications in Power System Analysis Laboratory	0	0	2	60	40	100	1
BEEE1-728	Communication System Laboratory	0	0	2	60	40	100	1
BEEE1-729	Industrial Training & Project-I	--	-	--	60	40	100	8
Total 4 Theory & 2 Lab. Courses		**12**	**3**	**04**	**340**	**360**	**700**	**25**

B.TECH. ELECTRICAL AND ELECTRONICS ENGG. (8TH SEMESTER)

TOTAL CONTACT HRS. = 10, TOTAL CREDITS = 16

Course		Contact Hrs.			Marks			Credits
Code	**Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BEEE1-830	Pulse Wave shaping & switching	3	1	0	40	60	100	4
BEEE1-831	Software Laboratory	0	0	2	60	40	100	2
Departmental Elective-V		3	1	0	40	60	100	4
BEEE1-872	Electrical Machine Design							
BEEE1-873	Biomedical Instrumentation							
BEEE1-874	Flexible AC Transmission Systems							
BEEE1-875	Special Electrical Machines							
BEEE1-832	Project-II	--	-	--	60	40	100	6
Total 2 Theory & 1 Lab. Courses		**6**	**2**	**2**	**180**	**220**	**400**	**16**

List of Open Electives offered by Department of Electrical and Electronics Engineering to Students of other Departments Subjects

Open Elective-I

BEEE-151XX	Subject Name
BEEE-15191	Power Plant Engineering
BEEE-15192	Analog & Digital Circuit Analysis
BEEE-15193	Digital Signal Processing

Open Elective-II

BEEE-162XX	Subject Name
BEEE-16294	Renewable Energy Resources
BEEE-16295	High Voltage Engineering
BEEE-16296	Substation Equipment & Design

Open Elective-III

BEEE-173XX	Subject Name
BEEE-17397	Electrical Machine Design
BEEE-17398	Soft Computing
BEEE-17399	Image Processing

ENGINEERING MATHEMATICS-III

Subject Code: BMAT0-F91 **L T P C** **Contact Hrs.- 45**
3 1 0 4

UNIT-I (13 Hrs.)

Fourier Series: Periodic function, Fourier Seies, Dirichlet's conditions, Fourier series for even and odd functions, Change of interval, Half range Fourier series, Other forms of Fourier series.
Fourier Transforms: Dirichlet's conditions, Fourier integral formula (without proof), Fourier transform, Inverse Theorem for Fourier transform, Fourier sine and cosine transforms and their inversion formulae. Properties of Fourier transform, Convolution theorem of Fourier transforms, Parseval's identity.

UNIT-II (10 Hrs.)

Laplace Transforms: Laplace transforms of various standard functions (Exponential, Algebraic, Sine, Cosine), Properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function,
Application of Laplace Transforms: Solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

UNIT-III (12 Hrs.)

Partial Differential Equations: Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients. Classification of partial differential equation.
Applications of PDEs: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation in Cartesian Coordinates, solution by the method of separation of variables.

UNIT-IV (10 Hrs.)

Functions of Complex Variable: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; Conformal Mapping: Definition, standard transformations, translation, rotation, inversion, bilinear. Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs), singular points, poles, residue, Integration of function of complex variables using the method of residues(Integration Of type $\int_0^{2\pi} F(Cos\theta, Sin\theta)d\theta$, $\int_{-\infty}^{\infty} \frac{f(x)}{F(X)}dx$)

Recommended Books:

1. E. Kreyszing, 'Advanced Engineering Mathematics', 8th Edn., John Wiley, New Delhi.
2. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, New Delhi.
3. Ian N. Sneedon, 'Elements of Partial Differential Equations', McGraw- Hill, Singapore, **1957**.
4. Peter. V. O'Nil, 'Advanced Engineering Mathematics', Wadsworth Publishing Company.
5. H.C. Taneja, 'Engineering Mathematics', Volume-I & II, I.K. Publisher.

CIRCUIT THEORY

Subject Code: BEEE1-301 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To aware the students about the basics of networks.
- To provide them basic concepts of different types of network theorems & their applications.
- To impart knowledge about different circuits, analysing and synthesizing methods of circuits.

Learning Outcomes:

- After the completion of course, students will be having skills to design, analyse and synthesize the circuits.
- Knowledge of mathematical forms such as Laplace transforms & designing of filters and circuits.

Contents

Unit-1 (12 Hrs)

CIRCUITS CONCEPTS: Independent and dependent sources, Signals and wave forms: Periodic and singularity voltages, step, ramp, impulse, doublet, loop currents and loop equations, node voltage and node equations, Network Theorems: Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Reciprocity.

Unit-2 (12 Hrs)

TIME AND FREQUENCY DOMAIN ANALYSIS: Representation of basic circuits in terms of generalized frequency and their response, Laplace transform of shifted functions, transient and steady response, Time domain behaviours from poles and zeros, Convolution Theorem.

Unit-3 (12 Hrs)

NETWORK SYNTHESIS: Network functions, Impedance and admittance function, Transfer functions, Relationship between transfer and impulse response, poles & zeros and restrictions, Network function for two terminal pair network, Sinusoidal network in terms of poles & zeros, Real liability condition for impedance synthesis of RL & RC circuits, Network synthesis techniques for 2-terminal network, Foster and Cauer forms.

Unit-4 (12 Hrs)

FILTERS SYNTHESIS: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, terminating half section, pass bands and stop bands, Design of Constant-K, m-derived filters, Composite filters.

Recommended Books

1. Abhijit Chakraborty, 'Circuit Theory', 2nd Edn., Dhanpat Rai, **2001**.
2. D. Roy Chaudhury, 'Networks & Synthesis', New Age International, **2001.**
3. J.A. Edminister, 'Electric Circuits', 4th Edn., Tata McGraw Hill, **2002**.
4. T.S.K.V. Iyer, 'Circuit Theory', Tata McGraw Hill, **2006**.
5. Mohan, Sudhakar Sham, 'Circuits & Networks Analysis and Synthesis', 2nd Edn., Tata Mc Graw Hill, **2005**.
6. M.E. Van Valkenberg, 'Network Analysis & Synthesis', PHI Learning, **2009**.
7. M.E. Van Valkenberg, 'Network Analysis & Synthesis', 3rd Edn., Pearson Education, **2006.**

ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Subject Code: BEEE1-302 **L T P C** **Contact Hrs.: 48**
3 1 0 3

Learning Objectives:

- To aware the students about the basics of Measurements and Instrumentation systems.
- To impart knowledge about different instruments for electrical parameters.
- To provide them basic concepts of different types of sensors and transducers.

Learning Outcomes:

- After the completion of course, students will be having skills to design, analyse and instruments.
- Gain the skill knowledge of bridges and CRO operations.

Contents

UNIT I (12 Hrs)

Measuring Instruments: Introduction to measuring techniques, Necessity of measurements, block diagram of measurement system, Types of instruments, classification of standards, Fundamental Unit and Derived units. Instrument Characteristics; accuracy and precision, indications of precision, repeatability, Threshold, Sensitivity and span. Different types of errors in measurement, statistical analysis of data, arithmetic mean, deviation, average and standard deviation, probable error. Principle of operation and Constructional Features; D'Arsonval Galvanometer, Moving Coil PMMC & Moving Iron instrument (Repulsion and Attraction type), Electrodynamics instruments, Electrostatic instruments and Thermoelectric Instruments Range Extension of Voltmeter and Ammeter.

UNIT II (12 Hrs)

Measurement of Resistance: Low, Medium and High resistance using Kelvin Double Bridge, Ammeter-Voltmeter method, substitution method, Wheat Stone Bridge, Loss of Charge and Megger.

Measurement of Inductance and Capacitance: Maxwell Inductance, Hay's, Anderson and Schering Bridges. Measurement of frequency by Wein bridge method.

UNIT III (12 Hrs)

Oscilloscope: Basic principle & construction of Analog CRO, sweep modes, applications in measurement of voltage, frequency (Lissajous pattern), Introduction to Dual Trace Oscilloscope, Digital Storage Oscilloscope, sampling oscilloscope. Comparison between analog and digital oscilloscope

Recorders: Strip Chart Recorders, X-Y Recorders, Ultraviolet Recorders, Magnetic Tape Recorders.

Display Devices: Digital display methods, Seven Segment LED display, Dot Matrix display and LCD Display.

UNIT IV (12 Hrs)

Basic Concept of measurement system, Transducer and its classifications, basic requirements of Transducer/Sensors. Displacement Transducers: LVDT, RVDT and Piezo Electric. Resistance Thermometer, Thermistors, Thermocouples and Strain Gauge Transducer: Basic principle of operation of Resistance strain gauge.

Recommended Books

1. Cooper Halfrick, 'Modern Electronic Instrumentation and Measurement Techniques', PHI, **1990**.
2. A.K. Sawhney, 'Electronic Instrumentation & Measurement', 19th Edn., Dhanpat Rai & Sons., **2011**.
3. Jones & Chin, 'Electronic Instruments and Measurement', 2nd Edn., **2010**.
4. J. Toppin, 'Theory of Errors', Wessely Publishing, 4th Edn., **2000.**

ELECTRICAL MACHINES-I

Subject Code: BEEE1-303 **L T P C** **Contact Hrs.: 48 Hours**
3 1 0 4

Learning Objectives:

- To aware the students about the basics of electromechanical energy conversion.
- To impart knowledge about different construction operation of Transformers.
- To study characteristics speed control methods and testing of different types of DC Generators and motors.

Learning Outcomes:

- After the completion of course, students will be having skills to analyse the transformer.
- Gain the skill knowledge of experimental performance and testing of Electrical DC Machines.

Contents

UNIT-1 (15 Hrs)

Single Phase Transformer: Construction, Theory and operation, E.M.F. equation, phasor diagram, rating of transformers, equivalent circuit, open and short circuit tests, back to back test, parallel operation of single phase transformer, Scott connection, voltage regulation and efficiency, Ideal Transformer.

Auto-Transformers: Construction, Theory and operation, phasor diagram, equivalent circuit.

Three Phase Transformer: Three winding transformer, parallel operation of three phase transformers, three phase transformer connections, phasor groups, three phase to two phase and six phase conversion, Harmonics and excitation phenomenon, inrush current phenomenon.

UNIT-2 (10 Hrs)

Basics of DC Machines: Review of construction, types of armature winding, physical concepts of winding pitches, derivation of EMF equation & types of excitation. Armature reaction and its effect on the performance, methods adopted for compensation of armature reaction.

UNIT-3 (10 Hrs)

Excitation and Commutation of DC Generator: characteristics of separately excited, shunt, series and compound generators, Compensating winding, Commutation and function of commutators, Improvement of commutation: Brush shift and interpoles.

UNIT-4 (13 Hrs)

Control of DC Machines: Types of DC motors. Torque equation, speed torque characteristics: shunt, series and compound motors. Starting & speed control of DC motors. 3- point starter & its step calculation. Speed control by controlling armature resistance, field excitation and armature voltage, Ward- Leonard method of speed control, Losses & efficiency of DC machines, Hopkinson's & Swinburne's test.

Recommended Books

1. P.S. Bhimra, 'Electrical Machinery', 6th Edn., Khanna Publisher, **2014**.
2. I.J. Nagrath & D.P. Kothari, 'Electric Machines', 3rd Edn., TMH, **2004**.
3. P.K. Mukherjee & S. Chakrabarty, 'Electrical Machines', 4th Edn., Dhanpat Rai Pub., **2007**.
4. S.K. Sen, 'Electrical Machinery', 3rd Edn., Khanna Publishers, **1998.**

ELECTRONIC DEVICES & CIRCUITS

Subject Code: BEEE1-304 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To aware the students about basic electronic components.
- To update the knowledge about amplification circuits to amplify the signal.
- Various types of circuits to generate signals.
- How electronic components are specified and selected for industrial applications.

Learning Outcomes:

- After the completion of the course, the students could have skills about the basic Electronic Circuits, their operational characteristics and their applications.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CONTENTS

UNIT I (12 Hrs)

Transistors Theory: Introduction to semiconductors, diodes, Bipolar Junction Transistor. Working action of NPN and PNP. CE, CB & CC configurations. Current components, Concept of D.C. and A.C. load line and operating point, Q point selection, bias stability, various biasing circuits- fixed bias, collector to base bias, emitter bias, voltage divider. Stability factors.

UNIT II (13 Hrs)

Transistor h-Parameter Equivalent Circuits: Analysis of transistor amplifier using h-parameters in CB, CE and CC configuration, The high frequency T- model, hybrid pi CE transistor model, hybrid pi conductance in terms of low frequency h parameters. Multistage amplifiers, RC coupled amplifier, its frequency response.

UNIT III (12 Hrs)

Power Amplifiers: its classifications according to mode of operation and driving output. Class A direct coupled with resistive load, operation of class- B power amplifier, Push-Pull Amplifiers, phase inverter, complementary- symmetry amplifier. Concept of feedback in amplifiers; Positive & Negative Feedback, effect of Negative Feedback on voltage gain, input & output resistance **Oscillators:** Principle of operation of different oscillator's circuits- RC Phase Shift, Wien Bridge, Hartley, Colpitts and Crystal

UNIT IV (13 Hrs)

Field Effect Transistors: Theory of FET construction & working P-channel & N-channel. Comparison with BJT. Its Characteristics JFET parameter- ac drain resistance, trans-conductance, amplification factor, dc drain resistance. Construction & working of MOSFET.

Recommended Books

1. Boylstad & Nashelsky. 'Electronic Devices & Circuits', 9th Edn., Prentice Hall Pub., **2010**.
2. Millman & Halkias, 'Integrated Electronics', Mc-Graw Hill Pub., 2nd Edn., **2001**.

3. Malvino, 'Electronic Principles', 7th Edn., Mc-Graw Hill Pub., **2007**.
4. V.K. Mehta, 'Principles of Electronics', 10th Edn., S. Chand., **2006**.
5. Donald L. Shilling & Charles Belowl, 'Electronic Circuits', 3rd Edn., TMH, **2009**.

ELECTRICAL MEASUREMENT & INSTRUMENTATION LAB

Subject Code: BEEE1-305 **L T P C**
0 0 2 1

Learning Objectives:

- To understand the working principal and construction of the measuring instruments and recorders.
- To measuring various electrical parameters using meters and transducers.
- To calibrate the measuring devices such as meters and transducers.

Learning Outcomes:

- After the completion of the course, the students could have skills about the basic measurement circuits, their operational characteristics and their applications.
- An ability to use the techniques and skills to CRO.

LIST OF EXPERIMENTS

1. Study of principle of operation of various types of electromechanical measuring instruments.
2. To measure high value of DC current and voltage using shunt and Multiplier.
3. To measurement of low resistance using wheat stone bridge.
4. To measure active and reactive power in 3-phase balanced load by one wattmeter method.
5. To measure the active power in 3-phase balanced and unbalanced load by two wattmeter method and observe the effect of power factor variation on wattmeter reading.
6. To study and calibrate Energy Meter.
7. Measurement of resistance using Kelvin's Bridge.
8. Measurement of self-inductance using Anderson's Bridge.
9. Measurement of capacitance using Schering Bridge.
10. Plotting of Hysteresis loop for a magnetic material using flux meter.
11. Measurement of frequency using Wein's Bridge.
12. To study the connections and use of Current and Potential transformers and to find out ratio error.
13. Determination of frequency and phase angle using CRO.
14. Measurement of unknown voltage using potentiometer.
15. To find 'Q' of an inductance coil and verify its value using Q-meter.

Note: Atleast ten experiments should be performed in semester

ELECTRICAL MACHINES-I LAB

Subject Code: BEEE1-306 **L T P C**
0 0 2 1

Learning Objectives:

- To understand the working principal and construction of the Transformer.
- To carry out laboratory experiments on electrical DC machines to find out parameters.

- To perform the experiments to draw the characteristics of DC machines.

Learning Outcomes:

- After the completion of the course, the students could have skills about the basics of testing of Transformer and DC machines.
- An ability to analyse possible causes of discrepancy in comparison to theory.

LIST OF EXPERIMENTS

1. To study cut section model and sketches of DC machine
2. To study cut section model and sketches of Transformer.
3. To perform load test on a single phase transformer.
4. To perform Open circuit and short circuit tests on a single phase transformer to determine equivalent circuit, voltage regulation and efficiency.
5. To find the efficiency and voltage regulation of single phase transformer under different loading conditions.
6. To perform parallel operation of two single phase transformers.
7. To study the various connections of three phase transformer.
8. To perform Scott connections on three phase transformer.
9. To measure armature and field resistance of DC shunt machine to obtain its open circuit characteristics.
10. To obtain load characteristics of DC shunt/series/compound generator.
11. To draw speed-torque characteristics of DC shunt/series/compound generator.
12. To study different types of DC motor starters.
13. To perform Swinburne's test on DC shunts motor.
14. To perform no load and blocked rotor test on DC shunt motor.

ELECTRONIC DEVICES & CIRCUITS LAB

Subject Code: BEEE1-307 **L T P C**
0 0 2 1

Learning Objectives:

- To understand the Characteristics of various semiconductor devices and construction of different electronic circuits using the above devices.
- To introduce variety of sources to obtain specifications of electronic devices & to impart knowledge about write technical reports related to basic electronic circuits using correct technical vocabulary.
- Able to understand identification and selection of various electronic components.

Learning Outcomes:

- An ability to understand all types of electronics devices and circuits
- An ability to design and conduct experiments, as well as to analyse and interpret data

LIST OF PRACTICALS

1. To analyse the response of Zener diode as regulator
2. To analyse the response of Half wave, full wave & Bridge rectifiers.
3. To plot the input and output characteristics of CE configuration.
4. To examine the characteristics of a Class- A amplifier.
5. To examine the characteristics of Class- B amplifier.

6. To analyse the characteristics of Class- B push-pull amplifier.
7. To analyse the characteristics of complementary symmetry amplifier.
8. To discuss the response of RC phase shift oscillator and determine frequency of oscillation.
9. To discuss the response of Hartley oscillator and determine frequency of oscillation.
10. To analyse the response of Colpitt's oscillator and determine frequency of oscillation.
11. To analyse the response of Wien Bridge oscillator and determine frequency of oscillation

Note: At least ten experiments should be performed in semester.

ELECTRICAL MACHINES-II

Subject Code: BEEE1-409 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To aware the students about basics of working principles of machines.
- To update the knowledge about illustrate starting and control of induction motors.
- To analyse the performance of induction motors

Course outcomes:

- The students will gain teaching skills in this domain.
- An ability to use the speed control schemes of machines.

CONTENTS

UNIT-I (9 Hrs)

Basic Concept of Electrical Machines: winding factors, generated E.M.F. and M.M.F, distributed winding, production of rotating magnetic field.

UNIT-II (14 Hrs)

Induction Machines: Constructional features, production of torque, equivalent circuit, phasor diagram, torque slip characteristics, Testing running light and blocked rotor test, load test, Effect of rotor resistance, double cage induction motor, Generator operation, starting methods of squirrel cage and wound rotor induction motor, Effect of space harmonics.

UNIT-III (9 Hrs)

Signal Phase Induction Motors: - Constructional features, double revolving field theory, Equivalent circuit, determination of parameters, different types of single phase induction motor and their starting methods & applications.

UNIT-IV (14 Hrs)

Synchronous Machines: Constructional features, salient and non-salient rotor.

Synchronous Generator – Generated emf, circuit model and phasor diagram, armature reaction, synchronous impedance, determination of voltage regulation by different methods, Parallel operation of alternators: - Synchronisation and load sharing.

Synchronous Motor – Operating principle, circuit model, phasor diagram, effect of load, operating characteristics of synchronous motor, V-curves and inverted V-curves, starting methods of synchronous motors, Two reaction theory, analysis of phasor diagram, power angle characteristics, determination of X_d and X_q.

Recommended Books

1. P.S. Bhimbra, 'Electric Machinery', 4th Edn., Khanna Publishers, **2011.**
2. Nagrath & Kothari, 'Electric Machines', 5th Edn., TMH, **2010**.
3. Fitzerald & Kingsley, 'Electric Machinery', 3rd Edn., MGH, **2007.**

LINEAR CONTROL SYSTEM

Subject Code: BEEE1-410 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To obtained transfer functions for electrical circuits, translational/rotational mechanical systems and electromechanical systems.
- To learn basic goals of control systems in terms of transient/steady state time response behaviour.
- To update the knowledge about control components.

Learning Outcomes:

- After the completion of the course, the students could have skills about the basics to model the control systems.
- An ability to analyse the stability of designed systems.

CONTENTS

UNIT-I (10 Hrs)

Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control system, closed loop control systems, stability, linear and non-linear systems, time variant and invariant, pole-zero location, Block diagrams, some illustrative examples.

UNIT-II (14 Hrs)

Modelling: Force voltage analogy, force current analogy, Laplace transforms, Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

Time Domain Analysis: Testing signals, Transient response of the first and second order systems, Time domain specifications, Steady state error and coefficients, PID controller, Absolute & relative stability, Routh-Hurwitz Criterion.

UNIT-III (14 Hrs)

Stability Analysis: Root locus technique, The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain and sketch of the root locus plot., Frequency domain analysis: Closed loop frequency response, bode plots, stability and loop transfer function, Frequency response specifications, Relative stability, Relation between time and frequency response for second order systems. Log. Magnitude versus Phase angle plot, Nyquist criterion for stability.

UNIT-IV (10 Hrs)

State Space Analysis: state space representations, transfer function, state transition matrix, controllability, observability.

Control Components: Error detectors – potentiometers and synchros, servo motors, A.C. and D.C. techno generators, Magnetic amplifiers.

Recommended Books

1. Dorf Richard C. and Bishop Robert H., Modern Control System, Addison –Wesley, Pearson New Delhi 12th Ed., 2014
2. Ogata K., Modern Control Engineering", Prentice Hall,5th Ed., 2008
3. Kuo B. C., Automatic Control System", Prentice Hall,6th Ed., 2010
4. Nagrath I.J. and Gopal M., Control System Engineering, Wiley Eastern Ltd.2nd Ed.,2004
5. B. S. Manke, Linear Control Systems,7th Ed., 2009

DIGITAL ELECTRONICS

Subject Code: BEEE1-411 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To provide knowledge about basics of digital electronics.
- To impart knowledge about designing of digital circuits.
- Students will use schematics and symbolic algebra to represent digital gates in the creation of solutions to design problems

Learning Outcomes:

- An ability to understand all types of combinational & sequential digital circuits and their designing.
- Students will have skills to simplify a digital design problem as part of the systematic approach to solving a problem.

CONTENTS

UNIT I (14 hrs)

Number System and Binary Code: Introduction, Binary, decimal, Octal, hexadecimal, BCD number system, Signed and unsigned number, binary operations - Addition, Subtraction. Multiplication and division. Subtractions using 1's and 2's compliment; ASCII code. Excess 3 codes and Gray code. Minimization of logic function:-OR, AND, NOT, NOR, NAND, Ex-OR gates, Basic theorem of Boolean Algebra sum of products and product of sums. Minimisation using theorems, minimisation using K-map up to 4 variables

UNIT II (12 hrs)

Combinational logic circuits: Combinational circuit design, multiplexer, demultiplexer, encoders, decoders, adders (Half adder, full adder), substracters and code converters, parity checker, BCD display drive, magnitude comparators.

UNIT III (13 hrs)

Sequential circuits: Flip Flop fundamentals, different flip flop configurations; SR, JK, D, T. Edge triggered and clocked flip flop, Registers; Types of Registers; series & parallel shift, circuit diagram, timing wave form and operations, counter, synchronous & asynchronous, Johnson counter.

UNIT IV (13 hrs)

D/A and A/D Converters: Introduction, Weighted register D/A converter, binary ladder D/A converter, D/A accuracy and resolution, parallel A/D converter Counter type A/D converter, Successive approximation A/D converter, Single and dual slope A./D converter, A/D accuracy and resolution.

Logic Families: Introduction; RTL, DTL & TTlL.

Recommended Books

1. R.P. Jain, 'Modern Digital Electronics', 4th Edn., TMH, **2011**.
2. Malvino & Leach, 'Digital Principals & Applications', 4th Edn., TMH, **1991**.
3. Fletcher, 'An Engg. Approach to Digital Design', PHI, Indian Edn., **2011**.
4. Sanjay Sharma, 'Digital Electronics', 1st Edn., Kataria Sons, **2011**.

POWER SYSTEM-I

Subject Code: BEEE1-412 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To provide knowledge about basics of transmission systems.
- To impart knowledge about representation of different power system components and loading capability of a generator
- Students will learn the basic concepts of mechanical and electrical design of transmission lines HVDC/EHVAC systems

Learning Outcomes:

- An ability to understand all types of different power system components
- Students will have skills to differentiate transmission and distribution systems

CONTENTS

UNIT-I (10 Hrs)

Generation of Electric Power: Brief description of Thermal, hydro nuclear and gas power plants & other non- conventional power plants. Legal aspects of electricity supply- Electricity acts, rules and codes, Standards followed in power supply, environmental and safety measures.

UNIT-II (12 Hrs)

Transmission and Distribution Systems: DC 2–wire and 3–wire systems, AC single phase, three phase and 4-wire systems, and comparison of copper efficiency.

Distribution Systems: primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulation.

UNIT-III (14 Hrs)

Overhead Transmission Lines and Cables: Types of Conductors, Line parameters; calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with stranded and bundle conductors, Generalized ABCD constants and equivalent circuits of short, medium & long lines, Ferranti and proximity effect.

Line Performance: regulation and efficiency of short, medium and long lines, Series and shunt compensation, Calculations of capacity of cables, charging current, stress, grading, heating of cables, Construction and characteristics of HV & EHV cable.

UNIT-IV (12 Hrs)

Overhead Line Insulators and Mechanical Design of Transmission Lines: Type, string efficiency, voltage distribution in string of suspended insulators, grading ring, preventive maintenance, Different types of tower, sag-tension calculations, sag-template, stringing charts, Corona-losses, Brief description of EHV/HVDC transmission.

Recommended Books

1. J. Grainger John and Jr. W.D. Stevenson, 'Power System Analysis', McGraw Hill, **1994**.
2. Harder Edwin.I, 'Fundamentals of Energy Production', John Wiley and Sons, **1982**.
3. J. Burke James, 'Power Distribution Engineering; Fundamentals and Applications', Marcel Dekk., **1996**.
4. C.L. Wadhwa, 'Electric Power Systems', 2nd Edn., Wiley Eastern Limited, **1985**.
5. I.J. Nagrath and D.P. Kothari, 'Power System Engineering', Tata McGraw Hill, **1995**.

ELECTROMAGNETIC FIELD THEORY

Subject Code: BEEE1-413 **L T P C** **Contact Hrs.: 48**
3 1 0 4

Learning Objectives:

- To provide knowledge about the propagation of electromagnetic wave along different mediums like guided, unguided Medias and in space with basic understanding of transmission lines and the method of solving different problems related to it.
- Study of physical concept and all the important fundamental parameters of transmission lines and waveguides.

Learning Outcomes:

- After the completion of the course, the students will be familiar with the concepts of electromagnetic field theory and fundamental equations fields.
- The students will have skills to identify, formulates, and solves engineering problems

CONTENTS

UNIT-I (10 Hrs)

INTRODUCTION: Fundamentals of Electrostatic and Magnetostatics. Time Varying Fields, Maxwell's equations in differential and integral forms concept of displacement current. Boundary conditions. Wave equation and its solution in different media, plane wave, Sinusoidal time variation, polarization.

UNIT-II (12 Hrs)

ELECTROMAGNETIC WAVES: Reflection of waves by perfect dielectrics and by perfect insulators. Surface impedance, Poynting theorem and Poynting vector. Guided Waves: Waves between parallel planes. TE and TM waves and their characteristics. TEM waves, velocities of propagation, Attenuation in parallel plane guides, wave impedance.

UNIT-III (12 Hrs)

TRANSMISSION LINES: Circuit representation of parallel plane transmission lines. Parallel plane transmission line with losses. Law loss RF and UHF transmission lines. Distortion less condition. Transmission line charts-impedance matching.

UNIT-IV (14 Hrs)

WAVE GUIDES: Rectangular and circular wave guides. TE and TM waves in rectangular wave guides. Impossibility of TEM wave in wave guides. Wave impedance and characteristics impedances. Transmission line analogy for wave guides. Attenuation and factor of wave guides. Dielectric slab wave guides.

Recommended Books

1. Jordan and Balmain, 'Electromagnetic Wave, PHI and Radiation System', **1998.**
2. Kraus, 'Electromagnetics', T.M.H., **2005.**
3. W.H. Hayt and J.A. Buck, 'Problem and Solutions in Electromagnetics', Tata McGraw Hill, **1997.**
4. W.H. Hayt, 'Engineering Electromagnetic', T.M.H., **1997.**

LINEAR CONTROL SYSTEM LAB

Subject Code: BEEE1-414 **L T P C**
0 0 2 1

Learning Objectives:

- To understand the basics of MATLAB software.
- To introduce variety of control system strategies.
- To comment about the stability of designed systems.

Learning Outcomes:

- To acquire skills to understand all types of control components
- An ability to analyse the stability of control systems

LIST OF EXPERIMENTS

1. Familiarization with MATLAB control system toolbox, MATLAB Simulink toolbox & PSPICE.
2. Determination of step response for first order & second order system with unity feedback and their display on CRO. Calculation and verification of time constant, peak overshoot, setting time etc. from the response.
3. Simulation of step response&impulseresponsefortype-0, type-1& type-2 systems with unity feedback using MATLAB &PSPICE.
4. Determination of Root Locus, Bode-Plot, Nyquist Plot using MATLAB-Control system toolbox for 2nd order system. Determination of different control system performance indices from the plots.
5. Determination of PI, PD, PID controller action of first order simulated process.
6. Experimental determination of approximate transfer function from Bode plot.
7. Evaluation of steady state error, setting time, percentage peak overshoot, gain margin, phase margin, with addition of lead compensator & by compensator in forward path transfer function for unity feedback control system using PSPICE.
8. Determination of control system specifications for variations of system parameters in practical position control system.
9. Design of a second order linear time invariant control system and study of system response with unit step input.
10. To study the characteristics of potentiometers and to use 2- potentiometers as an error detector in a control system.
11. To study the synchro Transmitter-Receiver set and to use it as an error detector
12. To study the Speed – Torque characteristics of an AC Servo Motor and to explore its applications.
13. To study the Speed – Torque characteristics of a DC Servo Motor and explore its applications.
14. To study various electro-mechanical transducers i.e. resistive, capacitive and inductive transducers
15. To study a LVDT (AC-AC, DC-DC) as a transducer and its processing circuits
16. To obtain the transfer function of a D.C. motor – D.C. Generator set using Transfer Function Trainer
17. To study the speed control of an A.C. Servo Motor using a closed loop and an open loop system

18. (i) To study the operation of a position sensor and study the conversion of position in to corresponding voltage (ii) To study an PI control action and show its usefulness for minimizing steady state error of time response.

At least ten experiments should be performed in a semester

DIGITAL Electronics Lab

Subject Code: BEEE1-415 **L T P C**
0 0 2 1

Learning objectives:

- To give students a practical knowledge about all types of digital circuits.
- To give students a working knowledge to connect digital circuits and verify their truth tables.
- To give students a knowledge about integrated circuits of different combinational and sequential circuits.

Learning Outcomes:

- An ability to test and verify working and truth tables of combinational and sequential circuits
- Working knowledge to study input output waveforms on digital storage oscilloscope
- Understand and commit to professional, ethics, responsibilities and norms of engineering practice.

LIST OF EXPERIMENTS

1. To Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates and their Realization of OR, AND, NOT and XOR functions using universal gates.
2. To Realize of Half Adder using Logic gates.
3. To Realize of Full Adder using Logic gates.
4. To Realize of Half Subtractor using Logic gates
5. To Realize of Full Subtractor using Logic gates
6. To Design 4-Bit Binary-to-Gray Code Converter.
7. To Design 4-Bit Gray-to-Binary Code Converter.
8. To study and design 4-Bit magnitude comparator using logic gates.
9. To study and design multiplexer Truth-table and their verification.
10. Realization of Half adder and Full adder using MUX.
11. To study and design Demultiplexer Truth table and their verification
12. Realization of Half subtractor and Full subtractor using DEMUX.
13. To study and verify Truth-table of RS, JK, D, JK Master Slave Flip Flops.
14. To design MOD-7 Synchronous up-counter using JK/RS/D Flip Flops.
15. To Study different shift registers, viz. SIPO, SISO, PIPO, PISO.
16. To Study digital logic families.

At-least ten experiments should be performed.