Electrical and ElectronicsEngineering

Course Structure and Course Syllabus for BEEand BEEE

Course Structure for BEE & BEEE								
S.No.	Course Code	Course Title	Dept.	Hours per week			Total Contact Hours	Credits
				L	T	P		
1	EE1101/1202	Basic Electrical Engineering	MME, ME/CSE	3	1	0	4	4
2	EE1701/1802	Basic Electrical Engineering Lab	MME, ME/CSE	0	0	2	2	1
3	EE1102	Basic Electrical & Electronics Engineering	CE	3	0	0	3	3
4	EE1702	Basic Electrical & Electronics Engineering Lab	CE	0	0	2	2	1
5	EE2104	Basic Electrical & Electronics Engineering	Chemical	3	1	0	4	4
6	EE2703	Basic Electrical & Electronics Engineering Lab	Chemical	0	0	3	3	1.5
7	EE1203	Basic Electrical Engineering	ECE	3	1	0	4	4
8	EE1803	Basic Electrical Engineering Lab	ECE	0	0	2	2	1

EE1101/1202 **Basic Electrical Engineering**

(common to CSE, ME / MME)

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **3-1-0-4**

Course Objectives: This course introduces

1. Basic concepts electrical DC and AC circuits, basic laws of electricity and methods to solve the electrical networks
2. Construction and operational features of energy conversion devices i.e. transformers , DC motors and induction motors.
3. Basics of Power Converters and Electrical Installations

Unit I :*DC Circuit*Analysis (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems, Maximum Power Transfer Theorem.Time-domain analysis of first-order RL and RC circuits.

Unit II : A*C Circuit* Analysis (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III: Electrical Machines (14 hours)

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer

Induction Motors: Construction and working of a three-phase inductionmotor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor.

DC Motors: Construction, working and torque-speed characteristic and speed control of separately excited dc motor.

Constructionand working of synchronous generators.

UNIT IV: Power Converters (8 hours)

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

UNIT V: Electrical Installations (8 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Course Outcomes: At the end of the course the student will be able to

1. Understand the basic concept of electrical circuits under DC and AC excitation and solve basic electrical circuit problems
2. Understand basic concepts of transformers and motors used as various industrial drives and evaluate their performance
3. Understand working of basic power converters used in electrical drives
4. Understand basic electrical installations such as protecting devices and batteries

Text books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. Electric Machines –by I.J.Nagrath&D.P.Kothari,TataMcGraw Hill, 7th Edition.2005

Reference books

1. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
2. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6^{th} edition.
3. Network Theory by N.C.Jagan&C.Lakshminarayana, B.S. Publications.
4. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
5. Electrical machines-PS Bhimbra, Khanna Publishers.

EE1701/1802 **Basic Electrical Engineering Lab**
(common to CSE, ME/ MME)

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-2-1**

COURSE OBJECTIVE:

To provide practical exposure to

- Common electrical components, their ratings and applications.
- Common electrical measuring instruments and their usage.
- Transformers, electrical machines and power electronic converters.

LIST OF EXPERIMENTS:

1. Introduction to Lab:
   (a) Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
   (b) Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
   (c) Demonstration of Components of LT switchgear.

2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step Change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.

3. Transformers: Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Open circuit&short circuit test on a single phase transformer.

5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

6. Speed control of dc shunt motor(a)Armature control method (b)Field control method.

7. Torque-Slip Characteristic of an induction motor.

8. Power electronics (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor

9. Calibration of Energy Meter

10. 3-phase power measurement using two wattmeter method

11. Characteristic of the lamps (Tungsten, Fluorescent and Compact Fluorescent Lamps)

12. Network theorems- Superposition, Thevenin and Norton Theorems.

COURSE OUTCOMES:

Student will be able to

- Understand principles of measuring instruments of voltage, current and power
- Analyze the characteristics and evaluate performance of DC Motor, induction motor and transformers, and evaluate performance basic power electronics converter used in electrical drives.

EE1102/2104BASIC ELECTRICAL AND ELETRONICS ENGINEERING
(For Civil / Chemical)

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **3-1-0-4**

Course Objectives:

This course introduces the concept of

1. Electrical DC and AC circuits, basic law's of electricity and methods to solve the electrical networks
2. Construction operational features of energy conversion devices i.e. transformers , DC motors and induction motors.
3. Basics of electronics, semiconductor devices and their characteristics and operational features.

Course Outcomes:

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

1. Understand the basic concept of electrical circuits under DC and AC excitation and solve basic electrical circuit problems
2. Understand basic concept and performance of transformers and motors used as various industrial drives

UNIT- I DC CIRCUIT ANALYSIS (10Hrs)

Electrical circuit elements: R-L-C Parameters, V–I relationship for Passive elements, Diode, Voltage and Current Independent and Dependent Sources

Circuit analysis: Kirchoff's Laws, Network reduction techniques – series, parallel, series parallel, star–to-delta, delta-to-star transformation, Source Transformation, Mesh Analysis and Nodal Analysis

Network Theorems - Thevenin's, Norton's, Maximum Power Transfer, Superposition

Step response of RL,RC and RLC circuits

UNIT- II AC CIRCUIT ANALYSIS (10 Hrs)

Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Parallel and Series parallel Combinations of R, L and C with Sinusoidal excitation, concept of reactance, Impedance, Susceptance and Admittance – phase and phase difference, Concept of Power Factor, j-notation, complex and Polar forms of representation.

Resonance – Series resonance and Parallel resonance circuits

UNIT- III THREE PHASE AC CIRCUITS (6Hrs)

Three phase ac circuits -Three phase EMF generation, delta and Y connections, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasor diagram, measurement of power in three phase circuits

UNIT- IV BASIC ELECTRONICS (10Hrs)

Introduction to electronics and electronic systems, Diode and Rectifier circuits (Half and Full wave), BJT, Transistor biasing. Small signal transistor amplifiers (CE), Operational amplifiers and their basic application, Introduction to digital circuits

UNIT- V ELECTRICAL MACHINES (12 Hrs)

Transformers : Construction, EMF equation, ratings, phasor diagram on no load and full load, equivalent circuit, regulation and efficiency calculations, open and short circuit test , applications

DC machines: Construction, EMF and Torque equations, Characteristics of DC generators and motors, applications

Induction motors: The revolving magnetic field, principle of orientation, ratings, equivalent circuit, Torque-speed characteristics, applications

TEXT BOOKS:

1. Electrical Technology- Hughes Prentice Hall, 7th edition
2. Problems In Electrical Engineering- S. Parker Smith, 9 edition
3. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
4. Millman's Electronic Devices and Circuits – J.Millman and C.C.Halkias, Satyabratajit, TMH, 2/e, 1998.
5. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
6. Electric Machines –by I.J.Nagrath&D.P.Kothari,TataMcGraw Hill, 7th Edition.2005

REFERENCES:

1. Electronic Devices and Circuits - K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
2. Electronic Devices and Circuits – Anil K. Maini, VarshaAgarwal –Wiley India Pvt. Ltd. 1/e 2009.
4. Network Theory by N.C.Jagan&C.Lakshminarayana, B.S. Publications.
5. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
6. Electrical machines-PS Bhimbra, Khanna Publishers.

EE1702/2703 BASICELECTRICAL&ELECTRONICS ENGINEERING LABORATORY(for Civil/Chemical)

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-2-1**

COURSE OBJECTIVE:

To provide practical exposure to

- To expose the students to the concepts of electrical and electronics circuits and their applications
- To expose the students to the operation of dc machines and transformer and give them experimental skills.

LIST OF EXPERIMENTS:

1. Introduction to Lab:
   (a) Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
   (b) Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

4. Open circuit & short circuit test on single phase transformer.
5. Verification of KCL&KVL.
6. Characteristic of the lamps (Tungsten, Fluorescent and Compact Fluorescent Lamps)
7. Verification of Network Theorems.
8. V-I characteristics of Diodes and BJT
9. Half-wave and full-wave rectifiers, rectification with capacitive filters, zener diode
10. Studies on logic gates

COURSE OUTCOMES:

Student will be able to

- Understand principles of measuring instruments of voltage, current and power
- Analyze the characteristics of semiconductor devices and understand their applications
- Analyze the characteristics and evaluate performance of DC machines and transformers