Department of Electrical Engineering
Syllabus Structure for
Second Year B. Tech (Electrical Engineering) 2014-15

Approved by BoS
Electrical Engineering

On 07th Dec. 2013

Rajarambapu Institute of Technology, Rajaramnagar
(An Autonomous Institute)
<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Course Code</th>
<th>Subject Title</th>
<th>Contact Hours</th>
<th>Credits</th>
<th>Evaluation Scheme</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Min. Passing %</th>
<th>Min. Passing %</th>
<th>Max. Min. Passing %</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>SH2091</td>
<td>Engineering Mathematics –III</td>
<td>4 - - 4</td>
<td>4</td>
<td>ISE: 20</td>
<td>40</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE: 30</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: 50, 40</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>02</td>
<td>EE2031</td>
<td>DC Machines &amp; Transformer</td>
<td>3 1 4</td>
<td>4</td>
<td>ISE: 20</td>
<td>40</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE: 30</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: 50, 40</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>03</td>
<td>EE2051</td>
<td>Electrical Circuit Analysis</td>
<td>3 1 4</td>
<td>4</td>
<td>ISE: 20</td>
<td>40</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE: 30</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: 50, 40</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>04</td>
<td>EE2071</td>
<td>Analog Electronics</td>
<td>3 1 4</td>
<td>4</td>
<td>ISE: 20</td>
<td>40</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE: 30</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: 50, 40</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>05</td>
<td>EE2091</td>
<td>Power System Economics</td>
<td>3 1 4</td>
<td>4</td>
<td>ISE: 20</td>
<td>40</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE: 30</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: 50, 40</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>06</td>
<td>EE2511</td>
<td>DC Machines &amp; Transformers Lab</td>
<td>- - 4</td>
<td>2</td>
<td>ISE: --</td>
<td>50</td>
<td>50</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: --</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>07</td>
<td>EE2531</td>
<td>Electrical Circuits &amp; Simulation Lab</td>
<td>- - 2 1</td>
<td>1</td>
<td>ISE: --</td>
<td>100</td>
<td>50</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>08</td>
<td>EE2551</td>
<td>Analog Electronics Lab</td>
<td>- - 2 1</td>
<td>1</td>
<td>ISE: --</td>
<td>50</td>
<td>50</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: --</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>SH2511</td>
<td>Professional Skills Development-I</td>
<td>- - 2 1</td>
<td>1</td>
<td>ISE: --</td>
<td>50</td>
<td>50</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE: --</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>16 04 10 25</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Credits: 25, Total Contact Hours: 30 Hrs.
Note: Tutorial and Practical Shall be conducted in batches with batch strength not exceeding 25 students.
ISE: In Semester Evaluation  ESE: End Semester Examination

Revised syllabus Implemented from 2014-15
<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course Code</th>
<th>Subject Title</th>
<th>Contact Hours</th>
<th>Credits</th>
<th>Evaluation Scheme</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>Scheme</td>
<td>Max</td>
</tr>
<tr>
<td>01</td>
<td>EE2021</td>
<td>Alternating Current Rotating Electrical</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>ISE</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Machines</td>
<td></td>
<td></td>
<td></td>
<td>MSE</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>50</td>
</tr>
<tr>
<td>02</td>
<td>EE2041</td>
<td>Power Transmission &amp; Distribution System</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>ISE</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>50</td>
</tr>
<tr>
<td>03</td>
<td>EE2061</td>
<td>Electrical and Electronic Measurements</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>ISE</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>50</td>
</tr>
<tr>
<td>04</td>
<td>EE2081</td>
<td>Digital Electronics</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>ISE</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>50</td>
</tr>
<tr>
<td>05</td>
<td>EE2101</td>
<td>Signals and Systems</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>ISE</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>50</td>
</tr>
<tr>
<td>06</td>
<td>SH2011</td>
<td>Environmental Science</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>ISE</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSE</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Project</td>
<td>30</td>
</tr>
<tr>
<td>07</td>
<td>EE2521</td>
<td>A.C.Rotating Electrical MachinesLab</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>ISE</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>--</td>
</tr>
<tr>
<td>08</td>
<td>EE2541</td>
<td>Electrical and Electronic Measurements Lab</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>ISE</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>--</td>
</tr>
<tr>
<td>09</td>
<td>EE2561</td>
<td>Digital Electronics Lab</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>ISE</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ESE</td>
<td>--</td>
</tr>
<tr>
<td>10</td>
<td>EE2581</td>
<td>Mini Project (Environmental Science)</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>ISE</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>16</td>
<td>02</td>
<td>10</td>
<td>23</td>
<td>50</td>
</tr>
</tbody>
</table>

Total Credits: 23, Total Contact Hours: 28 Hrs.
Note: Tutorial and Practical Shall be conducted in batches with batch strength not exceeding 25 students.
ISE: In Semester Evaluation   ESE: End Semester Examination

Revised syllabus Implemented from 2014-15
Lecture Scheme: Lecture: 4 hours/week
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. solve linear diff equations and problems related to applications by using various methods of solution
2. determine Expansions of functions by using Fourier series
3. solve problems on probability Distributions by using different formula
4. determine Laplace transform and Inverse Laplace transform of various functions by using properties of Laplace transform and apply Laplace transform to Solve linear diff. equations
5. calculate Z-Transform and Inverse Z-transform by using different properties of z-Transform.

UNIT I
Linear Differential Equations:
Introduction and definition, Complete Solution of Linear Differential Equations with Constant Coefficients, Complete Solution of Linear Differential Equations with Variable Coefficients, RL, RC, and RLE circuits.

UNIT II
Fourier series:
Periodic functions, Dirichlet’s condition, Fourier Series, Euler’s formula, Fourier Expansion of periodic functions with period 2c, Fourier series of even and odd function, Fourier series of periodic functions with arbitrary periods, half range Fourier series.

UNIT III
Probability:
Random variables, Discrete and continuous distributions, Poisson, Normal and Binomial distribution.

UNIT IV
Laplace Transform:
Definition, Laplace transforms of standard functions, Properties of Laplace transform, Inverse Laplace transforms.

UNIT V
Laplace transform of periodic functions, Laplace transform of Heaviside unit-step function, Laplace transform of Dirac-Delta function, Applications of Laplace transform.

UNIT VI
Z Transform:
Definition, Z transform of standard functions, Properties of Z-transform, Inverse Z-transform
Textbooks: -
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)
Subject Code-EE2031: D. C. Machines and Transformers

Teaching Scheme: Lecture: 3 hours/week, Tutorial: 1 hours/week Lab: - 4 hours/week.
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. explain construction, working principle, characteristics, testing details of single phase and
   Three-phase Transformer
2. explain applications of various transformers such as auto transformers, scotts connections
   & troubleshooting of various transformers, various equipments used to diagnosis the fault. Study of relevant Indian Standard Specifications.
3. explain construction, working principle & various types of DC Machines.
4. explain characteristics, testing and speed control of various DC machines.
5. explain industrial Applications, troubleshooting and maintenance, various equipments
   used to diagnosis the fault. Study of relevant Indian Standard Specifications of DC
   machines

UNIT I
Transformers
Single-phase Transformer: Construction, working principle, characteristics, testing.

UNIT II
Three phase transformers
Three-phase Transformer: Construction, working principle, characteristics, testing.

UNIT III
Applications and Troubleshooting of Transformers
Applications of various transformers, auto transformers, schotts connections, troubleshooting of
various transformers, various equipments used to diagnosis the fault. Study of relevant Indian
Standard Specifications

UNIT IV
D.C. Machine
DC Machine: Construction, working principle, types.

UNIT V
Characteristics and Testing
Characteristics of various DC motors and generators, testing and speed control.
UNIT VI

Applications and Troubleshooting of DC Machines

Industrial Applications, troubleshooting and maintenance, various equipments used to diagnosis the fault. Study of relevant Indian Standard Specifications

Text Books:

1. “Performance and Design of DC Machines” by Clayton
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)
Subject Code-EE2051: Electrical Circuit Analysis

Teaching Scheme: Lecture: 3 hours/week; Tutorial: 1hour/week
Exam Scheme: Paper: 100 (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits.
2. identify, formulate, and solve engineering problems in the area circuits and systems.
3. design an electric system, components or process to meet desired needs within realistic constraints.
4. explain importance of various network topology methods for computer analysis of large networks.
5. implement network reduction techniques to solve power system networks.

UNIT I
Network Topology
Concept of graph, tree and co-tree, tie set and cut set matrices and Kirchhoff’s laws to network analysis, Choice between loop and nodal analysis, Concept of super node and super mesh, Dot convention for coupled circuits, concept of duality and dual networks.

UNIT II
Network theorems for AC and DC circuits
Superposition theorem, Thevenin theorem, Norton’s theorem, Maximum power transfer theorem, Reciprocity Theorem, Tellengen’s Theorem, compensation Theorem, Star - delta transformation.

UNIT III
Three Phase circuit analysis and Resonance:
Balanced and unbalanced Three-Phase system, vector diagrams of star and delta configuration, Voltage relations, active and reactive power relations, series & parallel resonance. Series resonance- resonant frequency, variation of impedance, admittance, effect of frequency on current & voltage across L & C, Effect of resistance on frequency response, Selectivity, B.W.& Quality factor. Parallel resonance: Anti resonance frequency, variation of impedance and admittance with frequency, Selectivity and B.W

UNIT IV
Two Port Network and Network Functions
Terminal pairs, Relationship of two port variables, Z, Y, transmission parameters and Hybrid parameters, Interconnections of two port networks, Network Functions for one port and two port, Calculations of network functions for ladder and general network, Poles and zeros, Restrictions
on pole and zero locations for driving point and transfer functions, Time domain behavior from pole and zero plot, stability of active network,

**UNIT V**

**Filters & Attenuators**
Definitions, classification & characteristics of different filters, filter fundamental such as attenuation constant ($\alpha$), phase shift ($\beta$) propagation constant ($\gamma$) characteristic impedance($Z_0$), Design & analysis of constant $K$, $M$ derived & composite filters (low pass, high pass, band pass & band stop filters): T & II sections. Attenuators - Definitions, classification, relation between neper & decibel, Analysis & design of T type, II type, $\alpha$ Lattice, bridged T & L types attenuators

**UNIT VI**

**Steady state and Transient Analysis**
Steady state analysis of single phase systems under sinusoidal excitation, Steady state analysis of balanced three phase systems under sinusoidal excitation, Network equations, initial conditions, transient analysis of RLC circuits.

**Text Books:**

1. Alexander and Sadiku, Electric Circuits, 2nd Ed., 2004

Revised syllabus Implemented from 2014-15
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)
Subject Code-EE2071: Analog Electronics

Teaching scheme: Lecture: 3 hours/week, Tutorial: - 1 hours / Week
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this module the learner will be able to:
1. acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, operational amplifier and their applications.
2. develop the ability to analyze and design analog electronic circuits.
3. analyze amplitude and frequency responses of common amplification circuits.
4. design Op-Amp Application circuits.
5. design and analyze power amplifier circuits.

UNIT I
Construction and application of Diode
P-type, N-type materials, Construction and operation of diode, Ideal diode, Load line Analysis, Configuration with DC inputs-parallel, series, half wave and full wave Rectification, clipper and clamper circuits, computer analysis.

UNIT II
Bipolar Junction Transistor
Operation and construction of transistor, operating point, fixed bias circuit, emitter stabilized bias, voltage divider bias, miscellaneous bias configuration, transistor switching networks, bias stabilization, transistor as an amplifier, UJT, V-I characteristics of UJT.

UNIT III
FET biasing and MOSFET
Construction and operation of FET, types of FET, fixed bias, self bias, voltage divider bias, The MOSFET, V-I characteristics, depletion and enhancement type MOSFETs, CMOS.

UNIT IV
Compound configuration and Power Amplifiers
Cascade connection, Darlington connection, feedback pair, current source circuit, Types of power amplifiers, Class A and Class B amplifier, operation and circuits, Distortion, Class C, D amplifiers.

UNIT V
Introduction to OP-AMP
General purpose op-amp, inverting, non-inverting and differential amplifier, characteristics of op-amp, signal conditioning circuit, adder, subtract, Input noise effect by positive feedback, zero crossing detector and voltage level detector with hysteresis,

Revised syllabus Implemented from 2014-15
UNIT VI

Applications of op-amp, DC and AC performance

Text Books:
1. Allen Mottershed, Electronic Devices and Circuits, PHI
2. Boylsted, Electronic Devices and Circuits, PEARSON.
3. R. Gaikwad, Op-amp and Linear IC: PHI
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)
Subject Code-EE2091: Power System Economics

Teaching Scheme: Lecture: 3 hours/week, Tutorial: - 1 hours / week
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. explain traditional and non-traditional Energy sources
2. explain variable load on power stations, cost of generation and depreciation methods.
3. implement different types of tariffs.
4. apply different methods of power factor improvement
5. explain different Supply systems used in power system

UNIT I
Traditional and non-traditional Energy sources
A perspective, brief introduction to generating stations -Hydro power plants, classification on the basis of head, advantages and disadvantages of low, medium and high head plants, pumped storage plants, review of steam and nuclear power plant, wind energy conversion systems, solar systems, Fuel cells, Comparison of these plants on the basis of installation cost, running cost, reliability and environmental effects, structure of power systems, growth of power system in India, trends Indian power industry,

UNIT II
Variable load on power stations
Introduction, electric industry structure, modern power system-generation, transmission and subtransmission, distribution, loads-types of loads, variation of load demands, various factors affecting generation such as – maximum demand, average demand, demand factor, diversity factor, total load demand and its variation, chronological load curve, load duration curve, energy load curve, mass curve, plant capacity factor and plant load factor.

UNIT III
Cost of generation
fixed and running cost of power plants, annualized fixed and running charges, depreciation fund and its calculation by straight line method, sinking fund method and fixed percentage method, Fixed and running cost of generation, overall cost for hydroelectric plants, thermal plants and nuclear plants, effects of various factors (like load diversity, load factor and load curve) on cost of generation.
UNIT IV
Tariffs
Different types of tariffs such as fixed rate tariff, block rate tariff, two-part tariff, maximum demand tariff, penalty for low p.f. and power factor tariff, off peak tariff, time of day (T.O.D.) tariff, M.D. calculation.

UNIT V
Power factor improvement
Concept of real, reactive and complex power and their effects on power system operation. Power Factor Improvement - Causes and disadvantages of Low power factor, power factor improvement using Static capacitors, synchronous condensers, phase advancers, FACT Devices.

UNIT VI
Supply systems
Electric supply system, typical AC power supply scheme, comparison of D.C. and A.C. transmission, advantages of high transmission voltage, various systems of power transmission, comparison of conductor material in overhead system and underground system, comparison of various systems of transmission, elements of a transmission line, economics of power transmission, economic choice of conductor size and transmission voltage, requirements of satisfactory electric supply.

Text Books:
2. V.K. Mehta, Principles of Power Systems, S. Chand & Co. Ltd
3. Soni Gupta Bhatnagar, A Course in Electrical Power, DhanpatRai Sons

Revised syllabus Implemented from 2014-15
Teaching Scheme: Practical: 4 hours/week
Exam Scheme: Practical: 100 Marks (ISE 50+ ESE 50)

**Course Outcomes:**
After learning this lab course students will be able to:
1. perform various experiments on DC machines.
2. perform various experiments on Transformer.
3. find out the characteristics of various machines along with their efficiencies.
4. analyze various parameters and predict the durability of the machines.
5. compare the performances of the machines by referring relevant standards.

**List of experiments**

1. Open circuit characteristic test on self-excited and separately excited DC shunt generator.
2. Speed control of DC shunt motor.
   a. By flux control method for self excited shunt motor
   b. Armature voltage control method for self excited shunt motor
   c. Supply voltage control method for separately excited shunt motor.
3. Efficiency calculations and characteristics by break load method.
4. Efficiency calculations by Swinburne test method.
5. Efficiency calculations by Hopkinson’s regenerative method.
7. Polarity test on single phase transformer.
8. Parallel operation of transformers.
9. Load test on transformer.
10. Open circuit and short circuit test on single phase transformer.
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)
Subject Code-EE2531: Electrical Circuits & Simulation Lab

Teaching Scheme: Practical: 2 hours/week
Exam Scheme: Practical: 100 Marks (ISE 100)

Course Outcomes:
After completion of this lab course students will be able to:
1. analyze responses of electrical circuits in real time.
2. design electrical networks using MATLAB/Pspice etc.
3. compare responses of real time electrical networks with simulations.
4. explain importance of virtual environment to analyze electrical networks
5. implement various network reduction techniques for power system analysis and modeling

List of experiments

1. Study of Ladder Network
2. Verification of Star Delta transformation
3. Verification of Superposition and Maximum power transfer Theorem
4. Verification of Norton’s and Thevenin’s Theorem
5. Study of step response of R-C, R-L and R-L-C Series circuit and verification using Pspice/MATLAB
6. Observation of series and parallel resonance
7. Calculations of Z, Y, ABCD and Hybrid parameters of two port network
8-10. Three programs of Network solution based on Pspice/ MATLAB software

Revised syllabus Implemented from 2014-15
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)

Subject Code-EE2551: Analog Electronics Lab

Teaching Scheme: Practical: 2 hours/week
Exam Scheme: Practical: 100 Marks (ISE 50+ ESE 50)

Course Outcomes:
After completing this lab course students will be able to perform on their own following experiments:

1. to obtain the characteristics of the Electronic devices and to understand applications of various electronic devices and elements.
2. to obtain the frequency response of CC and CE Amplifier.
3. to obtain the frequency response of common source FET and common gate FET Amplifier.
4. design, construct, and take measurement of various analog circuits to compare experimental results in the laboratory with theoretical analysis.
5. to understand various applications of Op-Amp.

List of Experiments:

1. Study of diode characteristics.
2. Design and implementation of Half wave rectifier.
3. Design and implementation of Full wave rectifier.
4. Study of various types of Clipper circuits.
5. Study of various types of clamper circuits.
6. Study of biasing methods of BJT.
7. Study of FET as an amplifier.
8. Study of op-amp as an inverting and non-inverting amplifier.
9. Study of op-amp as differentiator and integrator.
10. Study of op-amp as precision rectifier.
11. Study of IC555 in different modes- astable, monostable.
Subject Code-SH2511: Professional Skills Development-I

Teaching Scheme: Practical: 2 hours/week
Exam Scheme: Practical: ISE-100%  (Minimum Passing Marks: 50%)

Course Learning Outcomes:
After completion of the course students will be able to:
1. apply English as a language for specific purposes.
2. prepare themselves according to the requirements of professional life.
3. improve his personality traits.
4. improve the communication skills
5. demonstrate interpersonal skills

Instructions:
1. An online pre-test will be conducted at the beginning of first practical session.
2. Student is expected to learn all the topics in each unit.
3. Student will go through the content of each topic and attempt quizzes and other exercises during it.
4. Teacher/instructor will guide the students wherever necessary during the session.
5. As per the instructions from the teacher/instructor, student will attend a test at the end of each practical session.
6. Performance in each test (at the end of every session) will be converted to 10 marks.
7. An online post-test will be conducted at the end of last practical session.
8. Performance in the post-test (either online or designed by teacher) will be converted to 10 marks.
9. Individual student will get out of 10 marks for his attendance and performance in the practice sessions on Saturdays.

Details of the Practical

Personality Type Testing *(This will be done in introductory session)*
1. Goal Setting
2. Interpersonal Skills and Body Language - A Case Study
3. Presentation Skills
4. Teamwork
5. Creative Thinking and Divergent Thinking
6. Debate
7. Problem Solving and Proactive Mindset
8. Decision Making and Decision Making - A Case Study

Guidelines:
- Student will work on Globarena GEMS for 01hr.:20min. in each session.
- 10 min. are reserved for introduction to unit by the teacher (where required).
- Remaining 20 min. are reserved for test and other record keeping.
- Teacher/instructor will prepare or plan exercises/case studies/lab activities of each session to
check student’s level of understanding.

- Record of performance assessment will be prepared and preserved by teacher.

S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART I (SEM- III)
Subject Code-SH2511: Professional Skills Development-I

Teaching Scheme: Practical: 2 hours (on Every Saturday)
Exam Scheme: Practical: Attendance for and record of assessment of these sessions will be made part of ISE of Professional Skills (Practical)

Course Learning Outcomes:
After completion of the course students will be able to:
1. apply English as a language for specific purposes.
2. prepare themselves according to the requirements of professional life.
3. improve his personality traits.
4. improve the communication skills
5. demonstrate interpersonal skills

Instructions:
1. Student is expected to learn all the sub-topics in each unit.
2. Student will go through the content of each topic and attempt quizzes and other exercises during it.
3. Teacher/instructor will guide the students wherever necessary during the session (If available during practice session).

Details of the Practical

1. Grammar:
   Sentence Structure (I) - Subject-Verb Agreement, Sentence Structure (III) – SVC
   Tenses (I) - Simple Present, (II) - Present Continuous, (III) - Present Perfect, (III) - Present Perfect Continuous Tenses, (IV) - Simple Past, (V) - Past Continuous, (VI) - Past Perfect, (VII) - Future Simple, (VII) - The Future Continuous Tense
   Simple and Compound Sentences, Complex Sentences,

2. Grammar:
   Articles, Phrases, Clauses, Prepositions, Active and Passive Voice, Direct and Indirect Speech (I), Direct and Indirect Speech (II), Question Forms, Modals, Conditionals, Transformation of Sentences (I), Transformation of Sentences (II)

3. Describing People:
   Elements of paragraph
   Describing People - II
   Description of People (II)

4. Description of Scenes:
   Description of Scenes (I)
   Description of Scenes (II)

5. Description of Processes:
   Description of Processes (I)
   Description of Processes (II)

6. Writing a Report:
   Writing a Report (I)
   Writing a Report (II)

7. Note-Taking and Note-Making

Revised syllabus Implemented from 2014-15
8. **Description of Activities (II), Writing Public Notices**

**Guidelines:**
- Student will work on Globarena GEMS for 01hr.:30min. in each session.
- 10 min. are reserved for introduction to unit by the teacher (where required).
- Remaining 10 min. are reserved for attendance and other record keeping.
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART II (SEM- IV)
Subject Code-EE2021: Alternating Current Rotating Electrical Machines

Teaching Scheme: Lecture: 3 hours/week Tutorial: 1 hour/week
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to explain:
1. different Types, construction, working principle & characteristics of three phase induction motors
2. application and Testing & characteristic of three phase induction Motor.
3. various Types, Construction, Principle of operation, & application of single phase induction motor
4. construction, working principle along with winding details of synchronous generator.
5. construction, performance, characteristics and testing of synchronous machine.

UNIT I
Three Phase Induction Motor
Types, construction, working principle, characteristics

UNIT II
Application and Testing
Various tests as per I.S.S., Industrial applications of induction Motor.

UNIT III
Single Phase Induction Motor
Types, Construction, Principle of operation, phasor diagram, equivalent circuit, Experimental determination of parameter, application.

UNIT IV
Synchronous Generator
Construction, working principle along with winding details.

UNIT V
Performance and testing of Synchronous Generator
Performance characteristics and various characteristics on synchronous generator.

UNIT VI
Synchronous Motor
Construction, performance, characteristics and testing of synchronous motor.

Revised syllabus Implemented from 2014-15
Textbooks:

4. Performance and design of A.C Commutator motors – O.E. Taylor
Subject Code-EE2041: Power Transmission & Distribution System

Teaching Scheme: Lecture: 3 hours/week
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:

1. explain structure of power systems
2. explain various Transmission line parameters and do respective modeling
3. explain various Design Aspects of Overhead Transmission Lines
4. explain construction & classification of various Underground Cables
5. explain various types of A.C and D.C. Distribution systems

UNIT I
Introduction to power system
A perspective, brief introduction to generating stations, structure of power systems, growth of power system in India, trends Indian power industry, Grid codes for interconnection. Per unit system, change of base. Power system components models, formation of bus admittance matrix.

UNIT II
Transmission line parameters and modeling
Resistance, inductance and capacitance of single phase and three phase line, concept of GMR and GMD, Skin effect, Proximity Effect, Corona effect. Transmission line models - short, medium and long lines, voltage and current waves, surge impedance loading of TL, complex power flow through transmission lines, power transmission capability, Ferranti effect, Tuned power lines, methods of voltage control.

UNIT III
Design Aspects of Overhead Transmission Lines
Main components of over-head lines, conductor materials, line supports, insulators, types of insulators, potential distribution over suspension insulators, string efficiency, methods of improving string efficiency, corona, factors affecting corona, important terms, advantages and disadvantages of corona, methods of reducing corona effect, sag in over-head lines and sag calculations.

UNIT IV
Underground Cables
Construction and classification of cables for single and three phase service, Insulation resistance, capacitance and dielectric stresses in cable, Most economical conductor size in cables, Grading of cables, capacitance grading and inter-sheath grading, Capacitance of three core cable and measurements of capacitances, Methods of laying underground cables.
UNIT V

D.C. Distribution system
Types of distributors, types of loading, DC distributor fed at one end, DC distributor fed at both end, ring distributor, three wire DC system, comparison of 3 wire and 2 wire dc distribution, ground detectors.

UNIT VI

A.C Distribution of Electrical Energy
Introduction, AC distribution calculations, AC distributors with concentrated loads, three phase unbalance loads, radial and ring main distribution, medium voltage distribution network, low voltage distribution network, single line diagram, substations.

Text Books:
Teaching scheme: Lecture: 3 hours/week  
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

**Course Outcomes:**
On successful completion of this module the learner will be able to:
1. demonstrate basic concept of calibration, statistical evaluation of measurement data.
2. explain construction & working of various electrical measuring instruments.
3. identify and demonstrate both Electrical and Electronic measuring instruments.
4. explain working of AC and DC bridges.
5. discriminate AC and DC bridges with applications.

**UNIT I**  
Basic Concept of Measurements and Instruments  
International Standards, Primary Standards, secondary Standards, Working Standards., Types of Error,. Multi range ammeter and voltmeter. Moving coil and Moving iron instrument: Construction and principle of operation of attraction and Repulsion type, limitation, scale equation of moving iron for power factor measurement, synchronoscope.

**UNIT II**  
Power and Energy Measurement  
Dynamometer wattmeter, power factor measurement, power measurement in single phase circuit, active and reactive power measurement in three phase circuit using wattmeters, Construction and working principle of single phase and Three phase energy meter, Error and their compensation, Three phase Trivector meter.

**UNIT III**  
Instrument Transformers  
Construction and working principle, phasor diagram, application of C.T. and P.T. and potentiometers

**UNIT IV**  
Measurement of Circuit Parameters  
A.C. Bridges: measurement Of Inductance and Capacitance, frequency measurement, Methods of measurement of low, medium and high range resistance. Wheatstone and slide wire bridge.

**UNIT V**  
Measurement Using Digital Instruments  

Revised syllabus Implemented from 2014-15
UNIT VI
Advanced Measuring Instrument
Digital Oscilloscope, wave and spectrum analyzer, Harmonic distortion analyzer, potentiometric recorders, Q-meters.

Text Books:
2. Electrical & Electronic Measurement -- A.K.Sawhney

References:-
1. Instrumentation Devices & Systems --- Rangan,Mani, Sharma
2. Process Control Instrumentation Technology – Johnson
3. Industrial Instrumentation and Control – S.K.Singh
Teaching Scheme: Lecture: 3 hours/week.
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this module the learner will be able to:
1. determine the philosophy of number systems and codes.
2. simplify the logic expressions using Boolean laws and postulates.
3. design logic expressions by using logic gates.
4. design combinational and sequential logic circuits applying Boolean algebra and k-map as tool to simplify logic expressions.
5. explain multiplexer, de-multiplexer, decoders.

UNIT I
Number Systems and Logic Gates
Binary number system, binary to decimal conversion, decimal to binary conversion Octal number system, Hexadecimal number system, binary to hexadecimal and hexadecimal to binary conversion, binary coded decimal (BCD), binary addition, subtraction, digital logic families-TTL, CMOS, logic gates.

UNIT II
Waveforms and Boolean Algebra
Waveform analysis, delayed clock and shift counter waveforms, combinational Logic, Boolean theorems, De-Morgan’s theorems, designing logic circuits, Reducing Boolean expression using Karnaugh maps, Programmable logic devices,

UNIT III
Adders and Flip-flops
Half adder, Full adder, 1’s complement adder/subtraction circuit, binary 2’s complement subtraction, Arithmetic Logic Unit (ALU), R-S Flip-flop, gated R-S flip-flop, D-flip flop, Master slave D and JK flip-flop

UNIT IV
Shift Registers and Counters

UNIT V
Schmitt Trigger Inputs and clocks, D to A and A to D Conversion
The Schmitt trigger inputs, using Schmitt trigger to square up an irregular wave, a SchmittTrigger clock, crystal oscillator, Resistor networks for D to A conversion, The TTL
digital to analog conversion, A to D conversion using voltage comparator, The successive approximation A to D converter, The DAC 0830 D to A converter IC.

UNIT VI

Decoders, Multiplexers, De-multiplexer and Displays

Decoders, de-multiplexer, multiplexers, using multiplexers to reproduce desired truth Table, Multiplexer and De-Multiplexer.

Reference Books

1. Digital Logic Design- Morries Mano, PHI.
2. Jain—Modern Digital Electronics, 2/e ,TMH
3. Leach & Malvino—Digital Principles & Application, 5/e, TMH
5. Givone—Digital Principles & Design, TMH
6. Digital Technology- Virendra Kumar, New Age.
Subject Code-EE2101: Signals and Systems

Teaching Scheme: Lecture: 3 hours/week, Tutorial: 1 hour/week.
Exam Scheme: Paper: 100 Marks (ISE 20 + MSE 30 + ESE 50)

Course Outcomes:
On successful completion of this module the learner will be able to:
1. describe signals mathematically and understand how to perform mathematical operations on signals.
2. identify and understand various system properties
3. estimate convolution using Laplace and Z transform
4. compute the Fourier series or Fourier transform of a set of well-defined signals from first principles
5. explain importance of signal processing techniques.

UNIT I
Signals in Natural Domain
Introduction, Description of signals and systems, Properties, Classification.

UNIT II
Analysis of LTI Systems

UNIT III
Signals in Frequency Domain

UNIT IV
Discrete signals in Frequency Domain:
Introduction to discrete Fourier series, Discrete Time Fourier Transform and Properties, DTFT spectrum.

UNIT V
Sampling and Reconstruction:

UNIT VI
Laplace and Z Transform
Introduction to Laplace Transform and Z-Transform, Region of Convergence, Properties of Laplace and Z Transform, Inverse Laplace and Z Transforms, Rational System Functions. Real Life applications
Text Books:
2. Linear systems and signals by B. P. Lathi, pub Oxford University press, 2nd Edi, 2005
3. Signals and systems by M. J. Roberts pub Tata Macgraw Hill 2005
4. Signals and systems by Simon Haykin pub Wiley 2003
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART II (SEM- IV)

Subject Code-SH2011: Environmental Science
(Common to all Second Year U. G. Program)

Teaching Scheme: 1 Lectures /Week
Evaluation Scheme: Theory - ISE-15 %, MSE-25 %, ESE-30%, Project- 30 %

Course Outcomes
After completion of the course students will be able to:
1. understand the importance and sensitivity of environment.
2. avoid over exploitation of natural resources and follow the environmental ethics.
3. do the sustainable practices for sustainable development.
4. protect environment and prevent environmental pollution.
5. apply their knowledge and skills to solve their environment related problems.

UNIT I
Natural Resources, Ecology and Environment 02

Natural Resources:
Forest resources: Use and over-exploitation, benefits and problems, Mineral resources: use and effects on forests, Water resources: Use and over-utilization of surface water and exploitation, environmental effects of extracting and using mineral resources, Food resources: Changes caused by agricultural practices, Conservation of Natural Resources.

Ecology and Environment:
Definition, Principles and Scope of ecology, Ecosystem: Structure and Functions, abiotic and biotic components, energy flows, food chains, food web, ecological pyramids, types and diversity, Biodiversity & its conservation.

UNIT II
Energy and Environment 02

Conventional and Non-conventional energy sources, Solar energy, fossil fuels: classification, composition, characteristics and energy content of coal, petroleum and natural gas, principles of generation of hydroelectric power, tidal, ocean thermal energy conversion, wind, geothermal energy, solar collectors, photovoltaic cells, nuclear energy, magneto hydrodynamic power, Energy from waste, Hydrogen the future fuel, bio-energy, energy from biomass and biogas anaerobic digestion.

UNIT III
Environmental Quality and Pollution Control 02

Pollution Types: Air pollution, Water Pollution, Noise Pollution, Soil Pollution, Marine Pollution, Radioactive Pollution, Thermal Pollution (Causes, sources and effects abatement methods), Environmental Hazards, Global Environmental problems: Ozone depletion, Global warming and Climate change, Vehicular pollution etc.
Toxic chemicals in the environment: Air, water, pesticides in the water, biochemical aspects of As, Cd, Pb, Hg, CO, O2, O3 and PAN pesticides, insecticides, MIC, Carcinogens in the air.

UNIT IV 02
Solid Waste, Hazardous waste and Disaster Management
Solid Waste management: Causes, Effects and control measures of urban and industrial waste, radioactive waste; Types of Radiation and their characteristics, Sources of radioactive, methods of disposal and management, recycling of waste materials, waste minimization technologies, hazardous waste management, Disaster management and risk analysis: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc.

UNIT V 02
Environmental Management
Environmental impact assessment, Impact Assessment Methodologies, Environmental impact statement and environmental management plan, EIA guidelines, Guidelines for environmental audit, Baseline information and Predictions land, water, atmosphere, energy etc., Cost-benefit analysis, environment planning. Role of Central Pollution Control Board (CPCB), State Pollution Control Board, Role of NGO’s

UNIT VI 02
Environment and Society

Text Books:
1. ‘Ecology and Environment’ P. D. Sharma
2. ‘Environmental Studies’ by Dr. J. S. Samant, Shivaji University, Kolhapur
3. ‘Environmental Science & Engineering’ by Deeksha Dave and S. S. Katewa
4. ‘Environmental Science’ by V. K. Ahluwalia and Sunita Malhotra, Narosa Publication

30
Revised syllabus Implemented from 2014-15
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART II (SEM- IV)
Subject Code-EE2521: A.C. Rotating Electrical Machines -Lab

Teaching scheme: Practical: 4 hours/week
Exam Scheme: Practical: 100 Marks (ISE 50 + ESE 50)

Course Outcomes:
After learning this lab course students will be able to:
1. perform various experiments on AC rotating machines.
2. find out the characteristics of various AC machines along with their efficiencies.
3. analyze various parameters and predict the durability of the machine.
4. compare the performances of the machines by referring relevant standards.
5. identify proper machine for particular application.

List of Experiments
1. No-load and blocked rotor test on 3-phase Induction motor (IM).
2. Direct load test on 3-phase IM
3. Speed control of 3-phase IM
4. Study of various starters used for IM
5. 3-phase alternator regulation by direct load method.
6. 3-phase alternator regulation by synchronous impedance method.
7. Voltage regulation of 3-phase alternator by MMF method.
8. V-Curves on synchronous motor
Teaching scheme: Practical: 2 hours/week  
Exam Scheme: Practical: 100 Marks (ISE 50 + ESE 50)  

Course Outcomes:  
On successful completion of this course the learner will be able to:  
1. discuss the role of Electrical & Electronics measurements in industrial process  
2. apply safe laboratory practices.  
3. illustrate hands-on skills learned in the laboratory exercises.  
4. identify different types of electrical & electronic measuring instruments.  
5. calibrate various measuring instruments.  

List of experiments  
1. Measurement of power by two wattmeter method  
2. Measurement of reactive power.  
3. Calibration of single phase and three phase Energy meter.  
4. Measurement of inductance by using bridges  
5. Measurement of capacitance by using bridges  
6. Study of measuring instruments (M.I., PMMC)  
7. Measurement of power by ammeter and voltmeter.  
10. Study of digital meters  
11. Study of C.T. and P.T  
12. Study of Harmonic distortion analyzer
Teaching Scheme: Practical: 2 hours/week
Exam Scheme: Practical: 100 Marks (ISE 50+ ESE 50)

Course Outcomes:
On successful completion of this course the learner will be able to:
1. develop combinational and sequential logic circuits that meet the required functionality.
2. take responsibility as an individual or as a team member fulfilling appropriate roles to assure team success.
3. contribute useful inputs in relation to the team’s objective and communicate freely to teammates, give and provide feedback and suggestion to improve team outputs.
4. simulate and validate design logic circuits using simulation tool such as MultiSim, PCB Express and etc.
5. demonstrate importance of digital electronics in protection of power system network.

List of Experiments
1. Introduction to Digital Electronics Components
2. Study of circuits and families: AND, OR, NAND, NOR, XOR, Operations Using TTL and CMOS ICs.
5. Study of adders- half, full, BCD.
7. Study of counters-up/down, decade, synchronous, binary, BCD counters.
8. Study of MUX and DEMUX.
S.Y. B. Tech (ELECTRICAL ENGINEERING)-PART II (SEM- IV)  
Subject code-EE2581: Mini Project (Environmental Science)

Teaching scheme: Practical: 2 hours/week  
Exam Scheme: Practical: 100 Marks (ISE 100)

Course Outcomes:

On the successful completion of this course the students will be able to:
1. understand various environment issues and the responsibility of an engineer to save echo systems.
2. identify and analyze problems in the field of electrical engineering.
3. formulate and solve practical problems in systematic way by applying suitable skills, tools and methodologies.
4. demonstrate the team work with complementary skills.
5. work in interdisciplinary project assignments and disseminate knowledge by writing good technical report.

Guidelines

A group of 4-5 students will be formed by project coordinator and the Mini Project will be based on Environmental Issues related with Electrical Engineering.

Mini project Evaluation

Mini project will be assessed based on attributes like quality of project work, contribution and methodology.

ISE (100%) marks will be given by a panel of members allotted by DPC to the students based on their presentations and demonstration of the project work.