B. E. SYLLABUS

ELECTRICAL & ELECTRONICS
ENGINEERING

III & IV SEMESTER

With
Scheme of Teaching
& Examination
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qualification</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Nagesh Prabhu</td>
<td>M.Tech, Ph.D.</td>
<td>Professor &amp; HOD</td>
</tr>
<tr>
<td>2</td>
<td>Dr. Satyendra Kumar</td>
<td>Ph.D.</td>
<td>Professor</td>
</tr>
<tr>
<td>3</td>
<td>K. Vasudeva Shettigar</td>
<td>M.Tech</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>4</td>
<td>Mr. Suryanarayana K.</td>
<td>M.Tech (on Ph.D.)</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>5</td>
<td>Mrs. Nayana P Shetty</td>
<td>M.Tech (Ph.D.)</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>6</td>
<td>Mr. Rajaneesh Acharya</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>7</td>
<td>Mr. Naveen J</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>8</td>
<td>Mr. Pradeep Kumar</td>
<td>M.Tech (Ph.D.)</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>9</td>
<td>Mrs. Latha Shenoy</td>
<td>M.Tech (Ph.D.)</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>10</td>
<td>Ms. Anitha Marina Colaco</td>
<td>M.Tech (on Ph.D.)</td>
<td>Asst. Prof Gd II</td>
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<tr>
<td>11</td>
<td>Mr. Mahabaleshwara Sharma</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<tr>
<td>12</td>
<td>Mrs. Raksha Adappa</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<tr>
<td>13</td>
<td>Mrs. Soumya Rani Mestha</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>14</td>
<td>Mr. Gururaj K.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>15</td>
<td>Mr. Md. Abdul Raheman</td>
<td>M.E</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>16</td>
<td>Mrs. Cifha Crecil Dias</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>17</td>
<td>Mr. Raghavendra Prabhu</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>18</td>
<td>Mr. Dinesh Shetty</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>19</td>
<td>Mr. Ravikiran Rao</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>20</td>
<td>Ms. Swathi Hatwar H.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
</tbody>
</table>
Vision:

Pursuing excellence in Electrical & Electronics Engineering, creating a research environment to promote innovation and address global challenges.

Mission:

To equip students to face global challenges by excelling in professional career and higher education. To offer high quality graduate and post graduate programs in electrical & electronics engineering. To promote excellence in research, collaborative activities and contribute to social development with ethical values.

Programme Educational Objectives (PEOs):

1. Excel in professional career and / or higher education by acquiring knowledge in mathematical, electrical, electronics and computer engineering principles.
2. Analyze real life problems, design electrical and electronics & multidisciplinary engineering systems and solutions that are socially acceptable.
3. Inculcate and exhibit ethical values, communication skills and provide supportive and leadership roles in their profession to emerge as excellent professionals and adapt to current trends by engaging in lifelong learning.
Programme Outcomes (POs):
B.E, (E&E) Engineering students will attain the following outcomes at the end of the Programme.

1. An ability to apply knowledge of mathematics, science and engineering fundamentals to electrical & electronics systems.
2. An ability to analyze electrical & electronics engineering problem, identify and formulate the appropriate solution.
3. An ability to design and conduct experiments, as well as to analyze, interpret and validate data.
4. An ability to investigate and design a system, component or process to meet desired needs within realistic constraints.
5. An ability to use emerging Technologies, skills, and modern tools necessary for practicing Electrical Engineering.
6. An ability to identify, formulate and solve electrical engineering problems and contribute effectively for the development of the society
7. An ability to engage in sustainable design, keeping legal, social, environmental, health and safety issues.
8. An understanding of professional and ethical responsibility.
9. An ability to function in multidisciplinary teams.
10. An ability to communicate effectively.
11. An understanding of economic aspects of electrical & electronics engineering and management principles to manage the projects and finance.
12. An ability to strengthen the knowledge and understanding of electrical & electronics engineering systems by engage in lifelong learning.
### DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
### SCHEME OF TEACHING AND EXAMINATION

#### III SEMESTER B.E.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Code</th>
<th>Subject</th>
<th>Theory/Tuto./Prac./ Self Study</th>
<th>Total Hrs./Week</th>
<th>C.I.E.</th>
<th>S.E.E.</th>
<th>Credits</th>
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<td>D C and Synchronous Machines</td>
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### DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
### SCHEME OF TEACHING AND EXAMINATION

#### IV SEMESTER B.E.

<table>
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<tr>
<th>Sl. No.</th>
<th>Code</th>
<th>Subject</th>
<th>Theory/Tuto./Prac./ Self Study</th>
<th>Total Hrs./Week</th>
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VECTOR CALCULUS AND TRANSFORM TECHNIQUES

Sub code : 14EE301 Credtis : 04
Hrs/Week : 4+0+0+0 Total Hours : 52

Teaching Department: Mathematics

Course Outcomes:

At the end of the course student will be able to
1. Apply the vector functions and their derivatives for engineering applications
2. Understand the application Gauss divergence and Stoke’s theorem
3. Understand the concept of complex variables and line integrals in complex plane.
4. Apply Fourier analysis to engineering applications.
5. Apply the concepts of Z- transforms to engineering applications.

UNIT – I

UNIT – II

UNIT – III

10 Hours

8 Hours

12 Hours
UNIT – IV

Fourier Analysis: Periodic functions, Euler’s formulae, Fourier series of odd and even functions, functions with arbitrary period, half range series. Harmonic Analysis. Fourier integral theorem, Fourier Transforms, Inverse Fourier transform, Convolution theorem and Parseval’s identity. Fourier sine and Fourier cosine transforms, Inverse Fourier sine and Inverse Fourier cosine transforms (simple problems)

12 Hours

UNIT – V


10 Hours

TEXT BOOKS:

REFERENCE BOOKS:

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ELECTRICAL NETWORK THEORY I

<table>
<thead>
<tr>
<th>Sub code</th>
<th>Credits</th>
<th>Hrs/Week</th>
<th>Total Hours</th>
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</thead>
<tbody>
<tr>
<td>14EE302</td>
<td>04</td>
<td>3*+2+0+0</td>
<td>39*+26</td>
</tr>
</tbody>
</table>

*Note: Lecture hours indicated is for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.
**Course Outcomes:**
At the end of the course student will be able to

1. Analyze and solve problems pertaining to DC and AC circuits with independent and dependent sources.
2. Deduce and define CT and DT signals.
3. Expound the concepts of time domain representations using impulse response.
4. Explicate the behavior of RLC series and parallel circuits.
5. Comprehend the circuits using circuit theorems.

**UNIT - I**
Definitions of CT and DT signals and system, classification of signals, basic operations on signals. Elementary signals viewed as interconnections of operations, properties of system.  
7+5 hours

**UNIT - II**
8+6 hours

**UNIT - III**
Independent and dependent sources, source transformation, DC and AC multi-loop circuit analysis- mesh, node and mixed mesh and node analysis for electric circuit with linearly dependent and independent sources.  
8+5 hours

**UNIT - IV**
Coupled circuits, coefficient of coupling, dot convention for coupled coils and analysis of simple coupled circuits. Series and parallel resonance, Q factor, band width.  
8+5 hours

**UNIT - V**
Network theorems- superposition, reciprocity, Thevenin’s and Norton’s theorem, Maximum power transfer theorem, Telligens theorem, Millman theorem as to AC and DC circuits.  
8+5 hours
TEXT BOOKS:

REFERENCE BOOKS:
1. Electric circuits, Achakrabarthi, Dhanpath Rai and company.

DC AND SYNCHRONOUS MACHINES

Sub code : 14EE303 Credits : 04
Hrs/Week : 4+0+0+0 Total Hours : 52

Course Outcomes:
At the end of the course student will be able to
1. Distinguish different types of DC machines along with their characteristics and testing methods.
2. Understand the effect of the armature reaction and justify the use of interpole and compensating winding.
3. Predetermine the voltage regulation of Synchronous machine.
4. Illustrate synchronization of alternators to infinite bus and understand the performance characteristics for various operating conditions.
5. Depict the V and inverted V curves of synchronous machines and their applications.

UNIT - I
DC MACHINES: DC Generator-No load & load characteristics, armature reaction, commutation, use of inter poles & pole face compensating winding

6 Hours
DC Motors- Characteristics, Speed control of shunt & series motors, losses & efficiency

UNIT - II
Testing of DC motors – direct & indirect methods of testing of shunt and series machines. Permanent magnet DC motors, brushless DC motors

10 Hours

UNIT - III
Synchronous machines-Basic principle of operation, construction of salient & non Salient pole synchronous machines, Generated EMF in a concentrated winding, effect of distribution of winding & use of chorded coils, Regulation by EMF, MMF, ZPF Methods.

11 Hours

UNIT - IV
Synchronizing of Alternators to infinite bus bars, parallel operation of alternator

3 Hours
Operating characteristics, power angle characteristics, operation at constant load with variable excitation and vice versa for generating mode & motoring mode

8 Hours

UNIT – V
Salient pole synchronous machines, two reaction theory, power angle diagram, reluctance power, slip test

4 Hours
Synchronous Motors: Principle of operation, starting methods. Motor at load, Constant load variable excitation. V and inverted V curves, power flow equations, hunting in synchronous machines, synchronous condenser and Applications

6 Hours

TEXT BOOKS:
1. Bhimbra, Electric machinery, Khanna publishers
2. J. B. Gupta, AC and DC Machines

REFERENCE BOOKS:
1. AE Clayton & Hancock, Performance & design of DC machine
   ELBS Publication
2. Alexander Langsdorf, Theory of alternating current machines, TMH
3. Ashfaq Hussain, Electrical Machines, Dhanpat Rai Publications

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ANALOG ELECTRONICS CIRCUITS

Sub code : 14EE304  Credits : 04
Hrs/Week : 3*+2+0+0  Total Hours : 39*+26

*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Course Outcomes:
At the end of the course student will be able to
1. Design diode based clipping, clamping circuit and analyze the switching time of Diode. Also analyze transistor biasing circuits and understand the necessity for transistor bias compensating and stabilizing circuits.
2. Develop h-parameter equivalent network for the transistor amplifier at low and high frequencies and determine amplifier parameters like gain, input/output impedance.
3. Design and analyze transistor based multistage amplifiers, their frequency responses and power amplifier.
4. Analyze, Design transistor based feedback amplifier and oscillator circuit
5. Analyze MOSFET Internal Capacitances, High Frequency Model, Differential and Multistage Amplifiers.

UNIT – I

DIODE CIRCUITS: Diode Specifications, Transition Capacitance, Diffusion Capacitance, Diode Switching Time, Clippers, Clampers, Photo Diode, LED

3+2Hours

TRANSISTOR: Operating point, Bias stability, Base bias, Self bias or emitter bias, Voltage Divider bias Collector Bias Transistor as a switch, Bias compensation.

5+3Hours
UNIT – II

TRANSISTOR AT LOW FREQUENCIES: Graphical analysis of CE configuration. Transistor hybrid model, the transistor h parameters. Analysis of CE configuration using h-parameter model; Relationship between h-parameter model of CE, CC and CB configuration, the emitter follower, Millers theorem and its dual.

TRANSISTOR AT HIGH FREQUENCIES: The hybrid pi common emitter transistor model. Hybrid pi conductance, Hybrid pi capacitances. Miller Effect Capacitance,

5+4 Hours

UNIT – III


POWER AMPLIFIER: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. (BJT version only)

4+3 Hours

UNIT – IV

FEED BACK AMPLIFIERS: Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Input & Output resistance(derivation excluded) Practical Feedback circuit.(BJT version only)

3+2 Hours

OSCILLATORS: Oscillator operation, Phase shift Oscillator, Wien-bridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator Simple design methods for Oscillators (all BJT version only)

4+3 Hours
UNIT – V

MOSFET Internal Capacitances & High Frequency Model: Gate capacitive effect, junction capacitances, high frequency model, Biasing of FET, Common drain, common gate configurations, MOSFETs, unity gain frequency, frequency response of a CS amplifier, the three frequency bands, high frequency response, low frequency response, Depletion type MOSFET, JFET.

5+3 Hours

Differential and Multistage FET Amplifiers: Basic FET Differential Pair, Differential Amplifier with Active Load, Gain Stage and Simple Output Stage, Diff-Amp Frequency Response.

3+2 Hours

TEXT BOOKS:

REFERENCE BOOKS:

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DIGITAL ELECTRONICS CIRCUITS

Sub code : 14EE305
Credits : 04
Hrs/Week : 4+0+0+0
Total Hours : 52

Course Outcomes:
At the end of the course student will be able to
1. Recall different types of logic gates and rules of Boolean algebra and Simplify Boolean expressions using different methods
2. Analysis and design of combinational logic circuits
3. Analysis and design of sequential logic circuits
4. Explain the working of Flip Flops, shift registers and counters.
5. Know the construction of state machines.

UNIT - I
Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps 3, 4 and 5 variables, Incompletely specified functions (Don’t Care terms), Simplifying Max/min term equations.

6 Hours

Principles of combinational Logic-2: Quine-McCluskey minimization technique, Quine-McCluskey using don’t care terms, Reduced Prime Implicant Tables, Map entered variables.

5 Hours

UNIT - II
Analysis and design of combinational logic - I: General approach for combinational design, Decoders, BCD decoders, Encoders, Priority Encoder.

5 Hours

Analysis and design of combinational logic - II: Digital multiplexers- Using multiplexers as Boolean function generators, Demultiplexers, Adders and subtractors, Cascading full adders- Ripple Carry, Carry Look ahead, Binary comparators.

6 Hours

UNIT - III

10 Hours

UNIT - IV
Sequential Circuits – 2: Characteristic Equations, Registers-Shift registers, Bidirectional shift registers, Universal shift registers, Counters-Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a
Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops, Design of synchronous UP/DOWN counter, Decade counter

10 Hours

UNIT - V

Sequential Design - I: Introduction to Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis.

4 Hours

Digital Integrated circuits: Introduction, Bipolar transistor characteristics, RTL, DTL circuits, ECL, TTL, MOS, CMOS, I2L.

6 Hours

TEXT BOOKS:

REFERENCES BOOKS:

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ELECTRICAL AND ELECTRONIC MEASUREMENTS AND INSTRUMENTS

Sub code : 14EE306
Credits : 04
Hrs/Week : 4+0+0+S*
Total Hours : 52

*Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.
**Course Outcomes:**

At the end of the course student will be able to

1. Analyze and study the methods of measurement of resistance, capacitance and inductance using bridge circuits.
2. Expound the concepts of extension of instruments for the measurement of voltages and currents.
3. Explicate the working and construction of various meters used for the measurement of power, energy, frequency and phase.
4. Comprehend the measurement of electrical quantities using different electronic instruments and dual trace oscilloscope.
5. Apply transducers, display devices, LED, LCD, signal and function generators in electrical & electronics measurements.

**UNIT - I**

**Units and Dimensions**

**Self Study Topics** - {SI unit, Dimensional analysis (LMTI)}

Measurement of Resistance, Inductance, and Capacitance: Wheatstone’s bridge, sensitivity analysis, limitations, Murray Loop Test, Measurement of earth resistance by fall of potential method, Sources and detectors Maxwell’s bridge, Problems

**Self Study Topics** –{Schering bridge, Shielding of bridges and problems}  
10 Hours

**UNIT - II**

**DC Potentiometers**- Theory and Calibration of Voltmeter

**Self Study Topics**– {Theory and Calibration of Ammeter, Wattmeter}

Extension of Instrument Ranges: Principles of Shunts and multipliers used to extend instrument range, examples, Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T, Turns compensation, illustrative examples  
10 Hours

**UNIT - III**

**Measurement of Power and Related Parameters:**

Dynamometer wattmeter, Measurement of real and reactive power in three phase circuits, Principle of measurement of frequency and phase angle, Weston frequency meter, power factor meter and phase sequence indicator, Synchroscope
Self Study Topics – {Induction type energy meter construction, theory, errors, adjustments and calibration}  

10 Hours

UNIT - IV

Electronic Instruments:
Introduction, True RMS responding voltmeter, Electronic multimeters, ADC, DAC, Digital voltimeters, Q meter
Dual trace oscilloscope- front panel details of a typical dual trace oscilloscope

Self Study Topics – {Method of measuring amplitude, period, phase, frequency}
Use of Lissajous patterns, broken ring and modulated ring method,
Working of a digital storage oscilloscope.  

12 Hours

UNIT - V

Transducers: Classification and selection of transducers, Strain gauges, LVDT, Temperature measurements.

Self Study Topic- {Photo conductive and photo-voltaic cells, interfacing resistive transducers to electronic circuits}.
Display Devices and Signal Generators: Nixie tubes, LCD and LED displays.
Signal generators and function generators

10 Hours

TEXT BOOKS:
1. A. K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”,
1. Dhanpatrai and Sons, New Delhi.

REFERENCE BOOKS:

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ANALOG ELECTRONICS CIRCUITS LABORATORY

Sub code : 14EE307
Credits : 02
Hrs/Week : 0+0+3+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Design and test diode based Bridge Rectifier, clipping and clamping circuits
2. Design and test RC coupled Single stage BJT amplifier, BJT Darlington Emitter follower with and without bootstrapping and determine the gain-frequency response, input and output impedances.
3. Design and test transistor based RC Phase shift Oscillator and Crystal Oscillators
5. Design and test FET Multistage and differential amplifiers

LIST OF EXPERIMENTS:

1. Testing of Bridge Rectifier circuits with Capacitor filter, with and without Zener voltage regulator. Determination of ripple factor, regulation and efficiency.
3. Testing of Clamping circuits: positive clamping /negative clamping
4. Wiring of RC coupled Single stage BJT amplifier and determination of the gain-frequency response, input and output impedances.
5. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit)
7. Testing for the performance of BJT Crystal Oscillator for f_0> 100 KHz.
9. Multistage FET amplifier circuits to determine frequency response, input impedance output impedance.
10. FET differential amplifier to determine differential and common mode gains.

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DIGITAL ELECTRONICS CIRCUITS LABORATORY

Sub code : 14EE308
Credits : 02
Hrs/Week : 0+0+3+0
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Simplify and realize Boolean expressions using logic gates/Universal gates and design logic circuits to solve mathematical operations using logic gates and dedicated IC’s (adders conversion operations to be verified)
2. Design and test MUX/DEMUX using of IC 74153, IC 74139 for arithmetic circuits and code converter.
3. Design and test one/two bit comparator using logic gates and using 7485 IC
4. Design and test Decoder chip to drive LED display and Priority encoder.
5. Verification of the operation of JK Master slave, T type, D type flip flops and design counters and shift registers.

LIST OF EXPERIMENTS:
1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/ Full adder and Half/Full subtractor using logic gates.
3. (a) Realization of parallel adder/subtractor using IC 7483.
   (b) BCD to Excess-3 code conversion and vice versa using logic gates.
4. Realization of Binary to Gray code conversion and vice versa.
5. MUX/DEMUX – use of IC 74153, IC 74149 for arithmetic circuits and code converter.
6. Realization of one/two bit comparator using logic gates and using 7485 IC (magnitude comparator).
7. Use of
   (a) Decoder chip to drive LED display.
   (b) Priority encoder.
8. Truth table verification of Flip flops
   (a) JK Master slave
   (b) T type
   (c) D type
9. Realization of 3 bit counters as a sequential circuit and MOD-N counter design using IC 7476, IC 7490, IC 74192, IC 74193.
10. Shift left, shift right, SIPO, SISO, PISO, PIPO operations using IC 74S95.
11. Wiring and testing of Ring counter and Johnson counter using IC 7474 and IC 74S95.

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PROBABILITY THEORY AND NUMERICAL METHODS

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<th>Credits</th>
<th>04</th>
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<td>Hrs/Week</td>
<td>4+0+0+0</td>
<td>Total Hours</td>
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Teaching Department: Mathematics

Course Outcomes:

At the end of the course student will be able to

1. Understand and appreciate probabilistic models for situations involving chance effect.
2. Understand the applications of two and higher dimensional random variables and different types of distributions for engineering problems.
3. Apply numerical methods to solve engineering problems where the analytical solutions for some functions are not possible.
4. Apply numerical methods to solve partial differential equations.
5. Understand the application of ordinary differential Equations and Special Functions.

UNIT – I
Introduction to probability, finite sample space, conditional probability and independence. Baye’s theorem(Overview) One dimensional random variable; discrete and continuous random variable, probability functions, cumulative distribution function. Mean and variance. 10 Hours

UNIT - II
Two and higher dimensional random variables, joint probability distributions, marginal distributions. Expectation, covariance and correlation coefficient. Distributions: Binomial, Poisson, Normal, Exponential, Gamma and Chisquare distributions. 10 Hours

UNIT - III

UNIT - IV
Numerical solution Partial differential equations: Laplace and Poisson equations by standard five point formulae, heat and wave equations by explicit method. 10 Hours

UNIT – V
Series Solution of Ordinary Differential Equations and Special Functions: Series solution-Fresenius method, Series solution of Bessel’s D.E leading to Bessel function of first kind. Equations reducible to Bessel
D.E The generating function for $J_n(x)$. Orthogonality of Bessel functions. Series solution of Legendre’s D.E. leading to Legendre polynomials. Rodrigue’s formula.

10 Hours

TEXT BOOKS:

REFERENCE BOOKS:

TRANSFORMERS AND INDUCTION MACHINES

Sub code: 14EE402
Credits: 04
Hrs/Week: 4+0+0+S*
Total Hours: 52

*Self Study to be exercised under the supervision of course instructor and to be restricted to not more than 10% of the total teaching hours.

Course Outcomes:
At the end of the course student will be able to
1. Explain the principle, types and analyze the performance of single phase transformer
2. Test the transformer for its efficiency and regulation and understand the operation of autotransformers, and possible three phase connections of a transformer.
3. Expound the construction, types, and analyze the three phase induction machine on no load and full load.
4. Get familiarized with the various tests and torque slip characteristics of an induction machine.
5. Understand the principles of starting and speed control methods of a three phase induction machine. Also explicate the theory and types of single phase induction machine.
UNIT – I

Transformers: Self Study Topics – {Principle of transformer action, voltage transformation, construction of shell, core single phase & three phase transformers}
Methods of cooling, types of transformers - power, distribution, instrument, welding, tap changing

4 Hours

Single phase transformers, analysis & performance: Ideal & practical transformers on no load, EMF equation, transformer on load vector diagrams, equivalent circuit, Losses, power & all day efficiency, Regulation, parallel operation & load sharing

6 Hours

UNIT - II

Testing: Polarity test, SC, OC test, Sumpner’s test

Self Study Topics – {Autotransformers: Principle, Saving of copper, Advantages/disadvantages}

5 Hours

3 Phase transformers: operational aspects, 3 phase transformer connection including open delta, bank of 1 phase transformer for 3 phase operation, phase conversion, Scott connection for 3 phase -2phase

5 Hours

3 winding transformer - Tertiary winding, equivalent circuit analysis of a two winding transformer as a magnetically coupled circuit.

2 Hours

UNIT - III

Induction Machines: Self Study Topics – {Concept of rotating magnetic field, operating principle, Classification & types- 1 phase, 3 phase, squirrel cage, slip ring }
Analysis & performance of 3 phase induction motor: Induction motor on no load & load, efficiency and losses, vector diagram, equivalent circuit

5 Hours
Syllabus of III & IV Semester B.E. / Electrical & Electronics Engg.

5 Hours

UNIT - IV
Performance of Induction Machine (HP, Torque, efficiency, current & power factor evaluation), Induction generator

Self Study Topics – {slip torque characteristics covering regions of motoring generating & Braking} 5 Hours

No load & BR tests, circle diagram & performance evaluation, cogging & crawling, equivalent and performance of double cage & deep bar motors 5 Hours

UNIT - V
Starting & control: Need for starter, DOL, Y-Δ autotransformer starting, speed control- voltage, frequency & rotor resistance variations (conventional) 6 Hours

Single phase induction motor: Self Study Topics- {double revolving field theory and principal of operation} Types of I phase IM split phase, capacitor start 4 Hours

TEXT BOOKS:
1. P. S. Bimbhra, Electrical Machinery, Khanna Publishers
2. A. Langsdortf, Theory of alternating current machine, TMH

REFERENCE BOOKS:
1. M.G Say, Performance & design of AC machines, CBS publishers
2. Nagarath and Kothari, Electrical Machine, TMH
3. Kosow, Electrical Machines and Transformers, 2/e, PHI
4. Ashfaq Husain, Electrical Machines, Dhanapathrai& co
5. Transformers,BHEL, Tata Mc Graw Hill

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MICROCONTROLLERS

Sub code : 14EE403
Credits : 04
Hrs/Week : 4+0+0+0
Total Hours : 52

Course Learning Objectives:

Intel 8051 - The Intel MCS-51 (commonly referred to as 8051) is a Harvard architecture, CISC instruction set, single chip microcontroller (µC) series which was developed by Intel in 1980 for use in embedded systems. One feature of the 8051 core is the inclusion of a boolean processing engine which allows bit-level boolean logic operations to be carried out directly and efficiently on select internal registers and select RAM locations. This feature helped cement the 8051's popularity in industrial control applications because it reduced code size by as much as 30%. Another feature is the inclusion of four bank selectable working register sets which greatly reduce the amount of time required to complete an interrupt service routine. Various Programming examples will be considered to explore other features of 8051.

TI MSP430 - The MSP430 microcontroller is ideally suited for development of low-power embedded systems that must run on batteries for many years. There are also applications where MSP430 microcontroller must operate on energy harvested from the environment. This is possible due to the ultralow power operation of MSP430 and the fact that it provides a complete system solution including a RISC CPU, flash memory, on-chip data converters and on-chip peripherals.

Course Outcomes:

At the end of the course student will be able to

1. Compare and distinguish Microprocessors and Microcontrollers, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture
2. Identify the architecture, Pin diagram, Memory organization, different addressing modes and analyze different types of instruction set of 8051 microcontroller
3. Illustrate Assembly language programs, C Programs for various applications including delay programs, interrupt program using 8051 timer/counter and demonstrate the use of serial communication for data transfer using 8051
4. Identify the architecture, Pin diagram and the low power features of MSP 430 microcontroller.
5. Develop the programming skills to interface various hardware with 8051

UNIT -I

The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks.  

Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing, Register addressing, Direct addressing, Indirect addressing, relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing.  

UNIT –II
Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction.  

8051 programming: Assembler directives, Assembly language programs, C Programming, Time delay calculations.  

UNIT - III
8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C.  

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232 (DB-9 only), Serial communication Programming in assembly and C.  

UNIT -IV
Motivation for MSP430 microcontrollers – Low Power embedded systems, On-chip peripherals (analog and digital), low-power RF capabilities. Target applications (Single-chip, low cost, low power, high performance system design). **MSP430 RISC CPU architecture**, Compiler-friendly features, Instruction set, Clock system, Memory subsystem. Key differentiating factors between different MSP430 families.

### 3 Hours

**Digital I/O – I/O ports** programming using C and assembly, Understanding the muxing scheme of the MSP430 pins.

### 2 Hours

**On-chip peripherals. Watchdog Timer, Comparator**, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.

### 2 Hours

**Using the Low-power features of MSP430**. Clock system, low-power modes, Clock request feature, Low power programming and Interrupt.

### UNIT - V

**8051 Interfacing and Applications**: Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing, DC motor interfacing and PWM

### 7 Hours

**Interfacing LED, LCD, External memory**. Seven segment LED modules interfacing. Example – Real-time clock.

### 4 Hours

**TEXT BOOKS:**

**REFERENCE BOOKS:**
2. MSP430 Teaching CD-ROM, Texas Instruments, 2008 (can be requested at http://www.uniti.in)

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ELECTRO MAGNETIC FIELDS

Sub code : 14EE404

Credits : 04

Hrs/Week : 3*+2+0+0

Total Hours : 39+26

*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

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

1. State and apply the Coulombs, Gauss Law to determine the electric field intensity and flux density resulting from various configurations of charge distributions.
2. Determine the electric potential and its relation to electric field intensity and analyze the properties of conductor, semiconductor, and dielectrics.
3. Evaluate capacitance of various geometrics and apply Poisson’s and Laplace’s equations for the calculation of Capacitances.
4. Comprehend Biot-Savart’s, Ampere’s Law for steady magnetic field and use Maxwell’s equations, Faraday’s law for time varying fields and Analyze magnetic forces, magnetic material, and calculation of inductance.
5. Analyze plane wave reflection and transmission at the boundaries and solve basic transmission line and Wave propagation problems and problems on skin effect.

UNIT – I

a) **Coulomb’s Law and Electric field intensity**: Experimental law of coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge.

4+3 Hours
b) **Electric flux density, Gauss’s law and Divergence:** Electric flux
density, Gauss’s law and Divergence, Vector operator\(\nabla\) and
Divergence theorem

4+3 Hours

**UNIT – II**
a) **Energy and Potential:** Energy expanded in moving a point charge
in an electric field, the line integral, Definition of Potential difference
and Potential, the potential field of a point charge and system of
charges, Potential gradient, Energy density in an Electrostatic field

4+3 Hours

**Conductors, dielectrics and capacitance:** Current and current
density, Continuity of current, Metallic Conductors, Conductor
properties and boundary conditions, Boundary conditions for perfect
dielectrics, capacitance and examples.

4+2 Hours

**UNIT – III**
a) **Poisson’s and Laplace’s equations:** Derivation of Poisson’s and
Laplace’s equations. Examples of the solutions of Laplace’s and
Poisson’s equation

3+2 Hours

b) **The steady magnetic field** : Biot – Savarat’s law, Ampere’s circuitual
law, curl, Stokes theorem, Magnetic flux and Magnetic flux density,
Scalar and vector magnetic potentials.

4+3 Hours

**UNIT – IV**
a) **Magnetic forces, Magnetic Materials and Inductance:** Force on a
moving charge, Magnetic boundary conditions, Inductance

4+3 Hours

b) **Time varying fields and Maxwell’s equations:** Faraday’s law,
Displacement current, Maxwell’s equation in point and integral form.

4+2 Hours

**UNIT – V**
a) **Transmission Lines:** Physical description of Transmission line
propagation, Transmission line equations, Lossless propagation,
Lossless propagation of sinusoidal voltages, voltage standing wave
ratio

4+3 Hours
b) **Uniform plane wave:** Wave propagation in free space and dielectrics, Poynting’s theorem and wave power, propagation in good conductors – skin effect

4+2 Hours

**TEXT BOOKS:**

**REFERNCE BOOKS:**

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**ELECTRICAL NETWORK THEORY – II**

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<tbody>
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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

**Course Outcomes:**
At the end of the course student will be able to
1. Expound the network topology and draw the graph of the network
2. Apply formulation of equilibrium equation and duality coupled circuits.
3. Explicate the three phase balanced and unbalanced star and delta connected load.
4. Comprehend the transient behavior and initial conditions of electrical networks. And analyze frequency response for the transformed networks.
5. Have an in depth understanding of two port networks using T and h parameters.

UNIT - I
Network Topology: Graph of network, concept of a tree and co-tree, incidence matrix, tie-set and cut set schedules, formulation of equilibrium equations in matrix form, solution of resistive networks, Principle of duality. (Covering R, RL, RLC circuits and coupled circuits, Tree enumeration)  
8+5 Hours

UNIT - II
Analysis of three phase unbalanced delta connected load, unbalanced four wire star
Connected load, unbalanced three wire star connected load, Analysis of unbalanced voltages/currents (symmetrical, clark’s components)  
7+5 Hours

UNIT - III
Transient behavior and initial conditions-Behavior of circuit elements under switching
Conditions and their representations, evaluation of initial and final conditions in RL, RC and RLC circuits with AC and DC excitations, Solution of network equations including coupled circuits  
8+6 Hours

UNIT - IV
Transformed networks and their solutions- Different inputs, transients and steady state analysis and frequency response  
8+5 Hours

UNIT - V
Two port networks-Short circuit admittance parameters, Open circuit impedance parameters, T-, H- parameters, Relationship between parameter sets.  
8+5 Hours

TEXT BOOKS:
1. F.F.Kuo, Network Analysis and Synthesis.
2. Electric Circuits, A. Chakrabarti,Dhanapath Rai and Company

REFERENCE BOOKS:
1. M.E.Van Valkenburg, Network Analysis
3. Desoer, Basic Electrical circuits
4. Joseph A Edminister, Theory and problems of Electric circuits, Schaum’s outline Series
5. Parker and Smith, Problems in Electrical Engineering

MICROCONTROLLERS LABORATORY

Sub code : 14EE406          Credits : 02
Hrs/Week  : 0+0+3+0          Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Develop assembly language program for various addressing modes and data transfer process
2. Develop assembly language program for data processing applications using arithmetic, logical and jump instruction.
3. Develop assembly language program to display application output through LCD display.
4. Develop C language program for interfacing stepper motor control
5. Develop C language program for interfacing ADC,DAC

I. PROGRAMMING
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.
Note: Programming exercise is to be done on 8051

II. INTERFACING:
Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.
1. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
2. Alphanumeric LCD panel and Hex keypad input interface to 8051.
3. External ADC and Temperature control interface to 8051.
4. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
5. Stepper and DC motor control interface to 8051.
6. Elevator interface to 8051.

DC AND SYNCHRONOUS MACHINES LABORATORY

Sub code  : 14EE407  
Credits     : 02
Hrs/Week    : 0+0+3+0  
Total Hours : 39

Course Outcomes:
At the end of the course student will be able to
1. Determine speed torque characteristics, BHP, efficiency of DC Machine.
2. Control the Speed of DC Machines
3. Synchronize alternators to infinite bus and understand the performance characteristics
4. Determine voltage regulation of Alternators

List Of Experiments:

1. Load characteristics of DC Generator
2. Load test on DC Motor-Determination of speed torque and BHP efficiency characteristics
3. Speed control of DC motors by Armature Voltage and Flux control methods.
4. Speed control of DC motors by Ward Leonard method.
5. Swinburnes Test
6. Hopkinson’s Test
7. Field test on series motors
8. Retardation test-Electrical braking method
9. Voltage Regulation of Alternator by EMF and MMF method
10. Voltage regulation of alternator by ZPF method
11. Slip test
12. V and inverted V curves of a synchronous motor

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INDIVIDUAL EFFECTIVENESS LABS (IEL)

Introduction

Entry Edge (E²) is an industry readiness program designed for technology undergraduates to help them enhance important individual behavior & skills, and become productive from the very beginning of their corporate carrier. The program places a high emphasis on the pedagogy of learning by doing.

As part of the program, students first go through individual behavior & skill labs (Individual Effectiveness Labs) in their II year of engineering curriculum and then participate in “hands on” and “minds on” team activities in a simulated work environment, to accomplish tasks and to solve real-world organizational issues during a week long Immersive Group Workshop (IGW) held in the III year of their engineering course.

INDIVIDUAL EFFECTIVENESS LABS (IEL)

Sub Code: 14EE408
Credits : 02
Hrs / Week: 0+1+3+0
Total Hours : 39

Course Outcome:

1. To help the students understand themselves. Identify and analyze personality/behavioral attributes of personal
effectiveness – exploratory orientation, self-disclosure, receptivity to feedback and sensitivity to others.

2. To help the students identify their primary and secondary motivators – what drives them for achievement?
   a. Understanding the student’s need for achievement
   b. Understanding how positive expectations lead to positive results.

3. To help the students to develop a goal driven mindset and to take the first steps into individual personal planning, controlling and measuring results.

4. To make the students aware of importance of communication and typical barriers to communication.

5. To help the students develop effective oral communication skills.

6. To help the students develop effective written communication skills.

7. To help the students develop listening skills.

8. To help the students participate in group discussions.

9. To help the students develop effective business presentation skills.

10. To help the students receive feedback with an open mind, respond to feedback and take the action on them.

11. To help the students develop time management and organization skills.

Contents

Module 1: Know Yourself

Self assessment profilers to identify and assess the following – Identify and analyze personality/behavioral attributes of personal effectiveness – exploratory orientation, self disclosure, receptivity to feedback, sensitivity to others.

Module 2: Achievement Motivation & Goal Setting

- Identifying primary and secondary motivators using a motivational profiler.
• Understanding need for achievement.
• Developing goal driven mindset.
• First steps into career planning.  8 Hours

Module 3: Communication Skills

• Effective oral communication
• Effective written communication
• Constructing effective messages (memo, letters, e-mails)
• Writing persuasively
• Correspondence etiquettes – letters & email
• Importance of listening responsively
• Handling conversations
• Effective group discussions  15 Hours

Module 4: Presentation Skills

• Understanding audience, presentation objectives, best practices & tools in preparation of presentation.
• Improving quality of presentation through better use of voice, eyes, gestures, visual aids.
• Presenting to groups
• Presenting one-on-one.  13 Hours

Module 5: Handling Feedback

• Seeking feedback
• Accepting feedback with an open mind
• Responding to feedback
• Actionizing feedback  6 Hours

Module 6: Time Management

• Introduction to Time Management and importance of managing self
Syllabus of III & IV Semester B.E. / Electrical & Electronics Engg.

- Beating procrastination
- Action plans-starting to achieve in a small way
- Scheduling skills

6 Hours

REFERENCE BOOKS:

2. Online reference materials provided as part of the Entry Edge program.

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