B. E. SYLLABUS

ELECTRICAL & ELECTRONICS ENGINEERING

III & IV SEMESTER

With

Scheme of Teaching

& Examination
# DEPARTMENT: ELECTRICAL & ELECTRONICS ENGINEERING

<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, PhD</td>
<td>Professor &amp; HOD</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Sathyendra 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>5.</td>
<td>Suryanarayana K</td>
<td>M.Tech (on PhD)</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>6.</td>
<td>Rajaneesh Acharya</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>7.</td>
<td>Naveen J</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>8.</td>
<td>Anitha Marina Colaco</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
</tr>
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<td>9.</td>
<td>Pradeep Kumar</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>10.</td>
<td>Latha Shenoy</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
</tr>
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<td>11.</td>
<td>Mahabaleshwara Sharma</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>12.</td>
<td>Raksha Adappa</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>15.</td>
<td>Cifha Crecil Dias</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>17.</td>
<td>Dinesh Shetty</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>19.</td>
<td>Swathi Hatwar</td>
<td>M.Tech</td>
<td>Asst. Prof</td>
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NMAMIT, NITTE  
DEPARTMENT OF ELECTRICAL &  
eLECTRONICS ENGINEERING

**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 (PEO)**

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 technically sound, economically feasible and 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 (PO)**

B.E, (E&E) Engineering students will attain the following outcomes at the end of the Programme.

a. An ability to apply knowledge of mathematics, science and engineering fundamentals to electrical & electronics systems.
b. An ability to analyze electrical & electronics engineering problem, identify and formulate the appropriate solution.
c. An ability to design and conduct experiments, as well as to analyze, interpret and validate data.
d. An ability to investigate and design a system, component or process to meet desired needs within realistic constraints.
e. An ability to use emerging Technologies, skills, and modern tools necessary for practicing Electrical Engineering.
f. An ability to identify, formulate and solve electrical engineering problems and contribute effectively for the development of the society.
g. An ability to engage in sustainable design, keeping legal, social, environmental, health and safety issues.
h. An understanding of professional and ethical responsibility.
i. An ability to function in multidisciplinary teams.
j. An ability to communicate effectively.
k. An understanding of economical aspects of electrical & electronics engineering and management principles to manage the projects and finance.
l. An ability to strengthen the knowledge and understanding of electrical & electronics engineering systems by engage in lifelong learning.
### DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

**Detailed scheme and syllabus for 2013-17 batch**

#### III Semester

<table>
<thead>
<tr>
<th>Sl.</th>
<th>Code</th>
<th>Subject</th>
<th>L-T-P</th>
<th>SS</th>
<th>Credits</th>
<th>CIE</th>
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<tr>
<td>1.</td>
<td>13EE301</td>
<td>Vector Calculus and Transform Techniques</td>
<td>4-0-0</td>
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<td>2.</td>
<td>13EE302</td>
<td>Electrical Network Theory-I</td>
<td>3-2-0</td>
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<td>3.</td>
<td>13EE303</td>
<td>D C and Synchronous Machines</td>
<td>4-0-0</td>
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<td>4.</td>
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<td>Analog Electronics Circuits</td>
<td>3-2-0</td>
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<td>Digital Electronics Circuits</td>
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<td>13EE306</td>
<td>Electrical and Electronics Measurements &amp; Instruments</td>
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<td>7.</td>
<td>13EE307</td>
<td>Analog Electronics Circuits Laboratory</td>
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<td>8.</td>
<td>13EE308</td>
<td>Digital Electronic Circuits Laboratory</td>
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### DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

**Detailed scheme and syllabus for 2013-17 Batch**

**IV Semester**

<table>
<thead>
<tr>
<th>Sl.</th>
<th>Code</th>
<th>Subject</th>
<th>L-T-P</th>
<th>SS</th>
<th>Credits</th>
<th>CIE</th>
<th>SEE</th>
<th>Total marks</th>
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<tr>
<td>1.</td>
<td>13EE401</td>
<td>Probability Theory and Numerical Methods</td>
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<td>2.</td>
<td>13EE402</td>
<td>Transformers and Induction Machines</td>
<td>4-0-0</td>
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<td>3.</td>
<td>13EE403</td>
<td>Microcontrollers</td>
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<td>4.</td>
<td>13EE404</td>
<td>Electro Magnetic Fields</td>
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<td>13EE405</td>
<td>Electrical Network Theory-II</td>
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<td>13EE406</td>
<td>Microcontrollers Laboratory</td>
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<td>7.</td>
<td>13EE407</td>
<td>DC and Synchronous Machines Laboratory</td>
<td>0-0-3</td>
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<td>8.</td>
<td>13EE408</td>
<td>I E Laboratory</td>
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**Total** 18-4-10  04  26  400  400  800

**32 Hours/week**
VECTOR CALCULUS AND TRANSFORM TECHNIQUES

Subject code : 13EE 301 Credits : 04
Hrs / Week : 4 Total Hours : 52

Prerequisites:
Vector algebra, infinite series, differentiation and integration, knowledge of complex numbers.

Course learning Objectives: At the end of the course the successful student is expected to:
1. know the application of vector functions, vector differentiation and vector integration
2. apply the results of topics like complex variables, Fourier Analysis, Z-transforms etc to solve engineering problems.

UNIT – I
Vector Calculus: Vector algebra, Vector differentiation- gradient, divergence, curl, laplacian, solenoidal and irrotational vectors, Curvilinear, Spherical & Cylindrical Co-ordinates. 10 Hrs

UNIT – II
Vector integration- Line, Surface & Volume integrals. Green’s, Gauss divergence & Stoke’s theorems. Applications. 8 Hrs

UNIT – III

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. 12 Hrs
UNIT – V

Z transforms: Z-transform, standard forms, linearity property, damping rule, shifting rule. Inverse Z-transform, Finite differences and difference equations, Solving Difference equations using Z-transforms. 10 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

ELECTRICAL NETWORK THEORY I

Subject Code : 13EE302  Credits : 04
Hrs / Week : 3*-2-0  Total Hours : 39*

Objectives: to get acquainted with standard signals and systems, interconnection and operation, the analysis of single phase electrical networks, coupled N/W and to study the network topology.

Prerequisite: Basic Electrical Engineering, differential equation

Outcome/ Expectation: Students are able to solve complex electrical networks.

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

UNIT - I

Definitions of CT and DT signals and system, classification of signals, basic operations on signals. Elementary signals, systems viewed as interconnections of operations, properties of system. 7 Hrs
UNIT - II
Time-domain representations for LTI CT & DT systems. Convolution: impulse response representation, properties of impulse response representation, differential and difference equation. 8 Hrs

UNIT - III
Independent and dependent sources, source transformation, DC and AC multiloop circuit analysis- mesh, node and mixed mesh and node analysis for electric circuit with linearly dependent and independent sources. 8 Hrs

UNIT - IV
Coupled circuits, coefficient of coupling, dot convention for coupled coils and analysis of simple coupled circuits. Series and parallel resonance, Q factor, bandwidth. 8 Hrs

UNIT - V
Network theorems- superposition, reciprocity, Thevenins and Norton's theorem, Maximum power transfer theorem, Telligens theorem, Millman theorem as to AC and DC circuits. 8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
1. Electric circuits, A chakrabarthis, Dhanpath Rai and company.
D C AND SYNCHRONOUS MACHINES

Subject Code : 13EE303  
Credits : 04  
Hrs / Week : 4  
Total Hours : 52

Objectives of the course: To understand the constructional features, working principle, characteristics, performance evaluation, testing and applications of different types of DC and Synchronous machines

Prerequisite: Basic Electrical engineering

Outcome / Expectations: Student should know the performance characteristics and applications of DC and Synchronous machines.

UNIT - I
DC MACHINES
DC Generator-No load & load characteristics, armature reaction, use of inter poles & pole face compensating winding 6 Hrs
DC Motors-Characteristics, Speed control of shunt & series motors, losses & efficiency 4 Hrs

UNIT - II
Testing of DC motors – direct & indirect methods of testing of shunt and series machines. Permanent magnet DC motors, brushless DC motors 10 Hrs

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- 4 Hrs
Regulation by EMF, MMF, ZPF Methods 7 Hrs

UNIT - IV
Synchronizing of Alternators to infinite bus bars, parallel operation of alternator 3 Hrs
Operating characteristics, power angle characteristics, operation at constant load with variable excitation and vice versa for generating mode & motoring mode 8 Hrs

UNIT – V
Salient pole synchronous machines, two reaction theory, power angle diagram, reluctance power, slip test 4 Hrs
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 Hrs

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

ANALOG ELECTRONICS CIRCUITS

Subject Code : 13EE304 Credits : 04
Hrs / Week: 3*-2-0 Total Hours : 39*

Objectives: To familiarize the construction, working and characteristics of electronic devices like diode, special diodes, transistors and their application like rectifier, clamping, clipping, amplifier and oscillators.

Prerequisites: Basic Electronics (1st year), Semiconductor Physics

Outcome/ Expectation: Students should be able to choose devices for different applications and design circuit for specific applications.

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

UNIT – I

DIODE CIRCUITS: Introduction, Diode Capacitance-Transition & Diffusion capacitance. Diode as a circuit element, Load line concept, Piecewise linear model. Clipping circuits, Clipping at two independent levels, Clamping, Comparators, Voltage doublers. Bridge rectifier with capacitor filter, ripple factor calculation. Special Type of Diodes
– Zener Diode, Zener Voltage Regulator, Photo diode, Schottky diode.

6 Hrs

UNIT – II
TRANSISTOR BIASING: Operating point, Bias stability, Base bias, Self bias or emitter bias, Bias compensation. 5 Hrs
TRANSISTOR AT LOW FREQUENCIES: Graphical analysis of CE configuration. Two port devices, The hybrid model, Transistor hybrid model, The h parameters. 4 Hrs

UNIT – III
Analysis of transistor amplifier circuit using h parameters, the emitter follower, Millers theorem and its dual. 4 Hrs
TRANSISTOR AT HIGH FREQUENCIES: The hybrid pi common emitter transistor model. Hybrid pi conductance, Hybrid pi capacitances. Miller Effect Capacitance, Multistage Frequency effects. 4 Hrs

UNIT – IV
GENERAL AMPLIFIERS: Classification of amplifiers, Distortion in amplifiers, Frequency response of an amplifier, RC coupled amplifier. Cascade, Cascode connection, Darlington Connection(Analysis Excluded), concept of differential amplifier. 5 Hrs
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. 4 Hrs

UNIT – V
FEED BACK AMPLIFIERS: Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Input & Output resistance(derivation excluded) Practical Feedback circuit. 3 Hrs
OSCILLATORS: Oscillator operation, Phase shift Oscillator, Wien-bridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator (BJT version only) 4 Hrs

TEXT BOOKS:
DIGITAL ELECTRONICS CIRCUITS

Subject Code : 13EE305
Credits : 04
Hrs / Week : 4
Total Hours : 52

Objective of the course: To get acquainted with different digital circuits such as combinational and sequential systems. Study of logic minimization techniques. Study of designing few combinational and sequential circuits like decoders, encoders, shift registers, counters and construction of state machines.

Prerequisite: Knowledge of different number systems, basics of Boolean Algebra

Outcome / Expectations: At the end of the course students are acquainted with the basics of digital design.

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. 6Hrs

Principles of combinational Logic-2: Quine-McCluskey minimization technique, Quine-McCluskey using don’t care terms, Reduced Prime Implicant Tables, Map entered variables. 5 Hrs

UNIT - II

Analysis and design of combinational logic - I: General approach for combinational design, Decoders, BCD decoders, Encoders, Priority Encoder. 5 Hrs


REFERENCE BOOKS:
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 Hrs**

**UNIT - III**

**Sequential Circuits – 1:**  
Basic Bi-stable Element, Latches, S’R’ 
Latch, Application of SR Latch, A Switch Debouncer, The SR Latch, 
The gated SR Latch, The gated D Latch, JK Latch-Race around 
condition, The Master-Slave Flip-Flops (Pulse-Triggered Flip - 
Flops):The Master-Slave SR Flip-Flops, The Master-Slave JK Flip- 
Flop, Edge Triggered Flip Flop: The Positive Edge-Triggered D Flip- 
Flop, Negative-Edge Triggered D Flip -Flop.  

**10 Hrs**

**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 Hrs**

**UNIT - V**

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

**4 Hrs**

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

**6 Hrs**

**TEXT BOOKS:**


**REFERENCES:**


8
# ELECTRICAL AND ELECTRONIC MEASUREMENTS AND INSTRUMENTS

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Credits</th>
<th>Hrs / Week</th>
<th>Total Hours</th>
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<tbody>
<tr>
<td>13EE306</td>
<td>04</td>
<td>4</td>
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**Objective of the course:**
To get acquainted with principle, construction and working of different electrical measuring instruments, to know the principle of measurement of electrical and non-electrical quantities using analog and digital techniques.

**Prerequisite:** Fundamentals of Electrical Engineering.

**Outcome /Expectations:** Students will know the working principle of measuring instruments.

## UNIT - I
Units and Dimensions- SI units, Dimensional analysis (LMTI) **4 Hrs**
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, Schering bridge, Shielding of bridges, Problems **6 Hrs**

## UNIT - II
DC Potentiometers- Theory and Calibration of V, A, W
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 Hrs**

## 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, Synchro scope, Induction type energy meter construction, theory, errors, adjustments and calibration **10 Hrs**

## UNIT - IV
Electronic Instruments:
Introduction, True RMS responding voltmeter, Electronic multimeters, ADC, DAC, Digital voltmeters, Q meter
Dual trace oscilloscope- front panel details of a typical dual trace oscilloscope, Method of measuring amplitude, period, phase, frequency, Use of Lissajous patterns, broken ring and modulated ring method, Working of a digital storage oscilloscope.  

**12 Hrs**

**UNIT - V**

Self Study Topic :
Transducers: Classification and selection of transducers, Strain gauges, LVDT, Temperature measurements, 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 Hrs**

**TEXT BOOKS:**

**REFERENCES:**

**ANALOG ELECTRONICS CIRCUITS LABORATORY**

**Subject Code : 13EE307**  
**Credits : 02**  
**Hrs / Week: 0-0-3**

**LIST OF EXPERIMENTS:**

1. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter, with and without Zenar voltage regulator. Determination of ripple factor, regulation and efficiency. (Two experiments)
2. Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection.
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 and Testing for the performance of BJT-RC Phase shift Oscillator.
6. Testing for the performance of BJT -Crystal Oscillator for \( f_0 > 100 \text{ KHz} \).
7. Wiring of BJT Darlington Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)
8. Testing for the performance of BJT – Hartley / Colpitts Oscillators for RF range \( f_0=100\text{KHz} \).
9. Op-amp applications I- voltage follower, inverting and non-inverting amplifier,
10. Op-amp applications II - summer, integrator, differentiator.

DIGITAL ELECTRONICS CIRCUITS LABORATORY

Subject Code : 13EE308  Credits : 02
Hrs / Week : 0-0-3

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.
   (a) Realization of parallel adder/subtractor using IC 7483.
   (b) BCD to Excess-3 code conversion and vice versa using logic gates.
3. Realization of Binary to Gray code conversion and vice versa
4. MUX/DEMUX – use of IC 74153, IC 74139 for arithmetic circuits and code converter.
5. Realization of one/two bit comparator using logic gates and using 7485 IC (magnitude comparator).
6. Use of
   (a) Decoder chip to drive LED display.
   (b) Priority encoder.
7. Truth table verification of Flip flops
   (a) JK Master slave
   (b) T type
   (c) D type
8. Realization of 3 bit counters as a sequential circuit and MOD-N counter design using IC 7476, IC 7490, IC 74192, IC 74193.
9. Shift left, shift right, SIPO, SISO, PISO, PIPO operations using IC 74S95.
10. Wiring and testing of Ring counter and Johnson counter using IC 7474 and IC 74S95.

**PROBABILITY THEORY AND NUMERICAL METHODS**

Subject Code : 13EE401            Credits : 04
Hrs / Week : 4                     Total Hours : 52

Teaching Department: Mathematics

Prerequisites:
Set Theory, Calculus, differential equations and finite differences.

Course learning Objectives: At the end of the course the student will be able to
1. understand and appreciate probabilistic models for situations involving chance effect.
2. learn some probability distributions both discrete and continuous and its applications in real life problems.
3. apply numerical methods to solve engineering problems where the analytical solutions for some functions are not possible.

**UNIT – I**

Introduction to probability, finite sample space, conditional probability and independence. Baye’s theorem. One dimensional random variable: discrete and continuous random variable, probability distribution function, cumulative distribution function. Mean and variance.  

10 Hrs
UNIT - II
Two and higher dimensional random variables, joint probability distributions, marginal distributions. Expectation, covariance and correlation coefficient.
Discrete probability distributions: Binomial, Poisson, Continuous probability distributions: Normal, Exponential distributions.  

UNIT - III
Numerical integration: General quadrature formula, Trapezoidal rule, Simpson’s one third rule, Simpson,s three eighth rule.  

UNIT - IV

UNIT – V

TEXT BOOKS:
REFERENCE BOOKS:

TRANSFORMERS AND INDUCTION MACHINES

Subject Code : 13EE402 Credits : 04
Hrs / Week : 4 Total Hours : 52

Objectives of the course: To understand the constructional features, working principle, characteristics, performance evaluation, testing and applications of different types of Transformers and induction motors

Prerequisite: Basic Electrical engineering

Outcome / Expectations: Students will know the performance characteristics and applications of Transformers and induction machines

UNIT - I
Transformers: Principle of transformer action, voltage transformation, construction of shell, core 1 phase & 3 phase transformers, methods of cooling, types of transformers -power, distribution, instrument, welding, tap changing
4 Hrs

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 Hrs

UNIT - II
Testing: Polarity test, SC, OC test, Sumpner’s test
3 Hrs

Autotransformers: Principle, Saving of copper, Advantages/disadvantages
2 Hrs
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 Hrs

3 winding transformer-tertiary winding, equivalent circuit analysis of a two winding transformer as a magnetically coupled circuit. 2 Hrs

UNIT - III
Induction Machines: Concept of rotating magnetic field, operating principle, construction, classification & types-1 phase,3phase, squirrel cage, slip ring 5 Hrs

Analysis & performance of 3 phase induction motor: Induction motor on no load & load, efficiency and losses, vector diagram, equivalent circuit 5 Hrs

UNIT - IV
Performance (HP, Torque, efficiency, current & power factor evaluation), slip torque characteristics covering regions of motoring generating & Braking, induction generator 4 Hrs

No load & BR tests, circle diagram & performance evaluation, cogging & crawling, equivalent and performance of double cage & deep bar motors 6 Hrs

UNIT - V

SELF STUDY TOPICS
Starting & control: Need for starter, DOL, Y-Δ autotransformer starting, speed control- voltage, frequency & rotor resistance variations (conventional) 6 Hrs

Single phase induction motor: Double revolving field theory and principal of operation, types of I phase IM split phase, capacitor start, 4 Hrs

TEXT BOOKS:
1. P. S. Bimbhra, Electrical Machinery, Khanna Publishers
2. A. Langsdorf, 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
MICROCONTROLLERS

Subject Code : 13EE403  Credits : 03
Hrs / Week : 3-0-1  Total Hours : 39

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.

Prerequisite: Digital Electronic Circuits
Course Outcome / Expectation: Students will be able to design, program and interface microcontroller system for a given problem.

UNIT - 1
The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, External Memory interfacing, Stacks. 3 Hrs
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 MSP430microcontrollers – 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.  
Digital I/O – I/O ports programming using C and assembly, Understanding the muxing scheme of the MSP430 pins.  
On-chip peripherals. Watchdog Timer, Comparator, Op-Amp, Basic Timer, Real Time Clock (RTC), ADC, DAC, SD16, LCD, DMA.  
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.  

2 Hrs
Case Studies of applications of MSP430 - Data acquisition system, Wired Sensor network, Wireless sensor network with Chipcon RF interfaces. Interfacing LED with MSP430  

3 Hrs

TEXT BOOKS:
5. MSP430 Teaching CD-ROM, Texas Instruments, 2008 (can be requested http://www.uniti.in )

ELECTRO MAGNETIC FIELDS

Subject Code : 13EE404  
Credits : 04  
Hrs / Week : 3-2*-0  
Total Hours : 39*

Prerequisite: Basic Electrical Engineering, Basic concepts of Physics
Objectives of the course: To familiarize the Electromagnetic, Electrostatic Fields,
Outcome /Expectations: Students will know the electromagnetic, electrostatic and their applications.
Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.
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.

b) Electric flux density, Gauss’s law and Divergence: Electric flux density, Gauss’s law and Divergence, Vector operator $\nabla$ and Divergence theorem

4 Hrs

c) 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

3 Hrs

b) 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 Hrs

c) 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 Poissons equation

4 Hrs

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

4 Hrs

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

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

4 Hrs

c) 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

3 Hrs

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

5 Hrs
TEXT BOOKS:

REFERENCE BOOKS

ELECTRICAL NETWORK THEORY – II
Subject Code : 12EE405 Credits : 04
Hrs / Week : 3-2*-0 Total Hours : 39*

Objectives: To get acquaintance with the analysis of single phase and three phase electrical networks, network theorems, to study the transient behavior of electrical networks
Prerequisites: Basic electrical engineering, linear constant coefficient differential equation solution
Outcome / Expectation: To be able to analyze and solve complex electrical network

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

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 Hrs
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 Hrs

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 Hrs

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

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

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

MICROCONTROLLEES LABORATORY

Subject Code : 13EE406  Credits : 02
Hrs / Week  : 0-0-3  Total Hours : 39

I. PROGRAMMING
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits
1. Arithmetic operations – bit addressable).
2. Counters.
3. Boolean & Logical Instructions (Bit manipulations).
4. Conditional CALL & RETURN.
5. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal -
6. HEX.
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter.

Note: Programming exercise is to be done on both 8051 & MSP430

II. INTERFACING:
Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.
8. Simple Calculator using 6 digit seven segment displays and Hex Keyboard interface to 8051.
9. Alphanumeric LCD panel and Hex keypad input interface to 8051.
10. External ADC and Temperature control interface to 8051.
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude.
12. Stepper and DC motor control interface to 8051.
13. Elevator interface to 8051.
DC AND SYNCHRONOUS MACHINES
LABORATORY

Subject Code : 13EE407
Credits : 02
Hrs / Week : 0-0-3
Total Hours : 39

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
INDIVIDUAL EFFECTIVENESS
LABORATORY I

Subject Code : 13EE408  Credits : 02
Hrs / Week : 0-1-3  Total Hours: 52

Objectives
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. 8 Hrs
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 Hrs

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  12 Hrs

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.  11 Hrs

Module 5: Handling Feedback
- Seeking feedback
- Accepting feedback with an open mind
- Responding to feedback
- Actionizing feedback  6 Hrs

Module 6: Time Management
- Introduction to Time Management and importance of managing self
- Beating procrastination
- Action plans-starting to achieve in a small way
- Scheduling skills  5 Hrs

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

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