B. E. SYLLABUS

ELECTRONICS & COMMUNICATION ENGINEERING

III & IV SEMESTER

With
Scheme of Teaching
& Examination
## DEPARTMENT: ELECTRONICS & COMMUNICATION ENGINEERING

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Qualification</th>
<th>Position</th>
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<tbody>
<tr>
<td>1.</td>
<td>Dr. K. Rajesh Shetty</td>
<td>Ph.D.</td>
<td>Professor/HOD</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. M.K. Parasuram</td>
<td>Ph.D.</td>
<td>Director</td>
</tr>
<tr>
<td>3.</td>
<td>Dr. Rekha Bhandarkar</td>
<td>Ph.D.</td>
<td>Professor</td>
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<tr>
<td>4.</td>
<td>Dr. K. V. S. S. S. Sairam</td>
<td>Ph.D.</td>
<td>Professor</td>
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<tr>
<td>5.</td>
<td>Prof. S. Chandrakanth Naik</td>
<td>M.S/MBA</td>
<td>Asso. Professor</td>
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<tr>
<td>6.</td>
<td>Mr. Durga Prasad</td>
<td>M.Tech(Ph.D)</td>
<td>Asso. Professor</td>
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<td>7.</td>
<td>Mrs. Sushma P.S.</td>
<td>M.Tech</td>
<td>Asso. Professor</td>
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<td>8.</td>
<td>Mrs. Shrividy G.</td>
<td>M.Tech</td>
<td>Asso. Professor</td>
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<td>9.</td>
<td>Mrs. Padmavathi K.</td>
<td>M.Tech</td>
<td>Asso. Professor</td>
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<td>10.</td>
<td>Mrs. Prabha Niranjan</td>
<td>M.Tech(Ph.D.)</td>
<td>Asso. Professor</td>
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<tr>
<td>11.</td>
<td>Mr. Sukesh Rao</td>
<td>M.Tech(Ph.D.)</td>
<td>Asso. Professor</td>
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<tr>
<td>13.</td>
<td>Mr. Mahaveera K.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>14.</td>
<td>Mrs. Sunitha Lasrado</td>
<td>M.Tech(Ph.D.)</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>15.</td>
<td>Mrs. Vidya Kudva</td>
<td>M.Tech(Ph.D.)</td>
<td>Asst. Prof Gd III</td>
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<td>16.</td>
<td>Mr. Satheesh Rao</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<td>17.</td>
<td>Mr. Ravindra K.S.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>18.</td>
<td>Mr. Pradyumna G.R.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>19.</td>
<td>Mrs. Roopa B. Hegde</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>20.</td>
<td>Mrs. Charishma</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>22.</td>
<td>Mrs. Shubha B.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>23.</td>
<td>Mr. Anil Kumar Bhat</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>25.</td>
<td>Mrs. Deepa K.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<td>26.</td>
<td>Mr. Dileep Kumar M.J.</td>
<td>M.Tech</td>
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<td>27.</td>
<td>Mr. Sudharshana</td>
<td>M.Tech</td>
<td>Asst. Prof Gd-I</td>
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<td>28.</td>
<td>Mr. Shivakumar B. R.</td>
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<td>30.</td>
<td>Mrs. Ramya Shetty</td>
<td>M.Tech</td>
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<td>31.</td>
<td>Mr. Prajwal Hegde N.</td>
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<td>32.</td>
<td>Mr. Karthik</td>
<td>M.Tech</td>
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<td>33.</td>
<td>Mrs. Anupama B.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>35.</td>
<td>Mr. Bomme Gowda</td>
<td>B.E(M.Tech)</td>
<td>Asst. Professor</td>
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<td>36.</td>
<td>Ms. Pajgnamala</td>
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<td>37.</td>
<td>Mrs. Aswathi</td>
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<td>38.</td>
<td>Ms. Anusha</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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</table>
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Vision:

Empowering people, Partnering in Community Development by achieving expertise requiring the knowledge of state of the art technology in the field of Electronics and Communication.

Mission:

To impart specialized education in the field of Electronics & Communication that contributes to the socio-economic development of the region and to generate technical manpower with high degree of credibility, integrity and ethical standards by providing vibrant learning environment.

Program: B.E. Electronics & Communication Engineering

Programme Educational Objectives (PEOs):

1. The Graduate should have a solid Foundation in Mathematical, science and Electronics Engineering Fundamentals required to solve Electronics and Communication Engineering problems and also which will help to pursue higher Studies and life-long learning needed for a successful professional career.
2. To inculcate in graduates professional, effective communication skills, teamwork Skills, multidisciplinary approach, and an ability to relate engineering issues to Broader social context.

**Programme Outcomes (POs) :**

1. Students will be able to identify, analyze and solve basic Electronics Engineering Problems, in Specific areas, by applying knowledge of Mathematics, science and Engineering with modern Engineering tools.

2. Students will demonstrate an ability to visualize and work on Laboratory and Multidisciplinary tasks.

3. Students will be able to understand engineering practice in the context of global, Economic, Environmental and societal realities
### 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>
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<td>1</td>
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<td>Vector Calculus and Transform Techniques</td>
<td>4+0+0+0+0</td>
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**TOTAL** | 29 | 29 | 400 | 400 | 26
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<td>Probability Theory and Numerical Methods</td>
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<td>Electronic Measurements and Transducers</td>
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<td>Electromagnetic Theory</td>
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<td>Digital System Design Using Verilog</td>
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VECTOR CALCULUS AND TRANSFORM TECHNIQUES

Sub Code : 14EC301  \hspace{1cm} Credit : 04
Hrs/Week : 4+0+0+0  \hspace{1cm} Total Hours: 52

Course Outcomes:

At the end of the course the student should be able 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.

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


10 Hours

UNIT – II

Vector integration: Line, Surface & Volume integrals. Green’s, Gauss divergence & Stoke’s theorems, Applications.

8 Hours

UNIT – III


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. 12 Hours

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 Hours

TEXT BOOKS:


REFERENCE BOOKS:


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ANALOG ELECTRONIC CIRCUITS

Sub Code : 14EC302  Credits : 04
Hrs/Week : 4+0+0+0  Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. Differentiate between the different diode types and design circuits using them.
2. Design and analyze BJT circuits using different small signal models.
3. Design and analyze the different applications of Transistors.
4. Understand the working of FETs and design and analyze its biasing circuits.
5. Analyze different FET circuits using small signal model and design some application circuits using FETs.

UNIT- I
Semiconductor Diodes and Applications: Diode Specifications [T1-1], Transition Capacitance, Diffusion Capacitance, Diode Switching Time, Varactor Diode, Tunnel Diode [T2-3], AND/OR Gates, Clippers, Clampers [T1-2] 9 Hours

UNIT-II
BJT Circuits and Small Signal Analysis: Transistor Biasing: Fixed Bias Circuit, Emitter Stabilized Bias Circuit, Voltage Divider Bias Circuit, and DC Bias with Voltage Feedback. [T1-4] BJTr Model, h-Model [T1-7], Analysis of Voltage Divider Bias and Voltage Follower Circuit[T1-8] 12 Hours

UNIT- III
Power Amplifiers, Feedback Concepts and Oscillators: Cascade and Cascode Connections, Darlington connection , Current Mirror Circuits [T1-5], Power Amplifier Definitions and Types, Series-Fed and Transformer Coupled Class A amplifier, Class B, Class C and D amplifiers, Transistor Phase Shift Oscillator [T1-12], Feedback concepts,
Feedback connection types, Practical feedback circuits, Oscillator operation, Phase shift oscillator, Tuned oscillator circuit [T1-14]  

12 Hours

UNIT- IV
MOSFETs: Structure of MOSFET, Operation of MOSFET, IV Characteristics, Channel Length Modulation, Transconductance, Velocity Saturation, Other Second-order Effects, MOS Device Models[T3-6], PMOS Transistor, Comparison of Bipolar and MOS [T3-6]  

8 Hours

UNIT-V
FET Analysis and Circuits: MOS Amplifier Topologies, Biasing, Realization of Current Sources, Common Source Stage: CS Core, CS stage with Current source load, CS stage with Diode connected load, CS stage with degeneration, CS core with Biasing, Common –gate stage: CG stage with biasing, Source Follower: CD core, CD with Biasing [T3-7] 
MOSFET Internal Capacitances and High Frequency Model, Frequency Response of CS Amplifiers [T4-8], Digital MOSFET Circuits: NOT, NAND and NOR (T2-6)  

11 Hours

TEXT BOOKS:


REFERENCE BOOK:


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NETWORK ANALYSIS

Sub Code : 14EC303            Credits : 04
Hrs/Week : 4+0+0+0            Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. **Reduce** the network using star delta transformation, source transformation.
2. **Apply** Loop and Node analysis with linearly independent and dependant sources for DC & AC networks.
3. **Analyze** super node and super mesh.
4. **Solve** the network using graph theory.
5. **Apply** various network theorems – Superposition, Reciprocity, Millman’s, Thevinin’s, Norton’s and Maximum power transfer theorem.
7. **Study** transient behavior and initial conditions of RL, RC, & RLC circuits for DC & AC excitations.
8. **Apply** Laplace transformation for the network.
9. **Study** two port network parameter.

UNIT- I

**Basic Concepts:** Practical sources, Source transformations, Network reduction using star- Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

**Network Topology:** Graph of a network, Concept of 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.  **12 Hours**

UNIT- II

**Network Theorems-I:** Superposition, Reciprocity and Millman’s theorems.
Network Theorems-II: Thevinin’s and Norton’s theorems; Maximum Power transfer theorem 12 Hours

UNIT-III
Resonant Circuits: Series and parallel resonance, frequency response of series and parallel circuits, Q-factor, Bandwidth.
Transient Behavior and Initial Conditions: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. 12 Hours

UNIT- IV
Laplace Transformation and Applications: Solution of networks, step, ramp and impulse responses, waveform synthesis. 8 Hours

UNIT- V
Two Port Network Parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, and relationship between parameters sets. 8 Hours

TEXT BOOKS:


REFERENCE BOOKS:


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DIGITAL ELECTRONIC CIRCUITS

Sub Code : 14EC304          Credits : 04
Hrs/Week : 4+0+0+0          Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. Identify different number representations, have knowledge of different coding schemes and design circuits composed of NAND and NOR gates.
2. Employ different circuit minimization techniques for simplifying Boolean functions.
3. Design and analyze Combinational logic circuits.
4. Design and analyze sequential devices such as Flip-Flops, Registers and Counters
5. Analyze and design synchronous sequential circuits.

UNIT- I

Digital Concepts and Number System: Digital and Analog Basic Concepts, Digital systems Overview. [T2-1]
Introduction to Number System: Positional number system [Decimal Numbers, Binary Numbers, Octal and Hexadecimal Numbers], Number System Conversions [T2-1] Complements, Signed Binary Numbers [T1-1] Binary Arithmetic, Binary arithmetic using Complementary codes [T2-1]
Logic gates: Logic gates, Positive and Negative Logic.
Digital IC parameters: Fan-in, Fan-out, IOL, IOH, IIL, IIH, VOL, VOH, VIL, VIH, tpHL, tPLH, VCC, ICC and dissipated Power. [T2-4.2] NAND and NOR Implementation, AOI and OAI Implementation [T1-3]
Binary Codes: BCD, Self-Complementing Code [Excess-3], Unit distance Code [Gray] [T2-1], Code conversions

11 Hours

UNIT- II

Boolean Algebra and Optimizations: Boolean Algebra: Basic Definitions [T2-3], Basic Theorems and Properties of Boolean
Algebra, Canonical and Standard Form [T1-2]. Problem Statement to truth Table, Deriving switching equations from truth table, logic circuit [T2-3] Gate Level Minimization: The Map Method (2, 3 & 4 Variable), POS Simplification, Don’t care Conditions [T1-3], Q-M Method, MEV Method [T2 -3] 12 Hours

UNIT - III


UNIT - IV

Synchronous Sequential Circuits: Introduction, Sequential Circuits, Storage Elements: Latches and Flip-Flops.[T1-5] Characteristic equations, Flip-Flop Conversions [T3-6], Registers, Shift Registers, Ripple Counters [T1-6] 8 Hours

UNIT - V

Sequential Circuit Design: Basic State machine concepts, Moore and Mealy models[T2-6], Analysis of Clocked Sequential Circuits. Design Procedure[T1-5], Synchronous Counters and Counter Design[T1-6, T3-7] 8 Hours

TEXT BOOKS:


REFERENCE BOOKS:


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SIGNALS & SYSTEMS

Sub Code : 14EC305  Credits : 04
Hrs/Week : 4+0+0+0  Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. Classify different types of signals and systems.
2. Determine the output of a LTI system.
3. Perform the basic operations on signals.
4. Check for system stability, causality, linearity etc.
5. Represent system using differential/difference equation
6. Solve difference equation.
7. Represent signals in frequency domain.
8. Analyze LTI systems in frequency domain.
9. Represent discrete time signals in Z domain.
10. Analyze discrete time LTI systems in Z domain.

UNIT - I

Introduction: Definitions of a signal and a system, classification of signals, basic operations on signals, elementary signals, systems viewed as interconnections of operations, properties of systems.


UNIT - II

Time-Domain Representations For LTI Systems – 2: properties of impulse response representation, differential equation representation (solution not included), difference equation representation and its solution, Block diagram representations.
Fourier Representation for Signals – 1: Introduction, Discrete time and continuous time Fourier series (derivation of series excluded) and their properties.  

UNIT- III
Fourier Representation for Signals – 2: Discrete and continuous Fourier transforms (derivations of transforms are excluded) and their properties.

UNIT- IV

UNIT- V

TEXT BOOK:


REFERENCE BOOKS:

ANALOG ELECTRONIC CIRCUITS LAB

Sub Code : 14EC306
Credits : 02
Hrs/Week : 0+0+3+0
Total Hours : 52

Course Outcomes:

After completing this course students are able to design and test the following circuits for the given specifications by performing experiments or simulation:

1. Clipping and clamping circuits.
2. Series and parallel resonant circuits.
3. RC coupled amplifier, Emitter follower, amplifier with feedback.
4. LC oscillator using BJT.
5. Practically prove the network theorems such as Thevenin’s theorem, Maximum power transfer theorem.
6. Find the characteristics of MOSFET.
7. Common source amplifier using MOSFET.
8. Digital circuits using BJTs and MOSFETS.

LIST OF EXPERIMENTS

Hardware experiments:

1. On Network Theorems
   a) Verification of Thevenin’s Theorem
   b) Verification of Maximum Power Transfer Theorem

2. Diode Circuits
   a) Testing of Diode Clipping Circuits.
   b) Testing of Clamping Circuits.

3. Transistor Circuits
   a) Design, study of a RC coupled single stage BJT amplifier.
b) Design & testing of a BJT Darlington Emitter follower
c) Design & testing of a BJT feedback amplifier

4. MOSFET Circuits
   a) Study of MOSFET characteristics
   b) Design study of a Common Source MOSFET amplifier.

Simulation experiments:

1. On Network Theorems
   a) To study series and parallel resonant circuits.

2. Diode Circuits
   a) Testing of Diode Clipping Circuits

3. Transistor Circuits
   a) Design and testing for the performance of BJT Hartley and Colpitt’s oscillator.
   b) Inverter, NAND and NOR gate using BJT.

4. MOSFET Circuits
   a) Inverter, NAND and NOR gate using MOSFET

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DIGITAL ELECTRONIC CIRCUITS LAB

Sub Code : 14EC307  Credits : 02
Hrs/Week : 0+0+3+0

Course Outcomes:

After Completing this course, a student should be able to

1. Understand the importance and need for verification and to apply troubleshooting techniques to test digital circuits.
2. Able to design and verify the truth tables of different logic gates.
3. Able to represent numerical values in various number systems and perform number conversions between different number systems.
4. Able to analyze and design digital combinational circuits like decoders, encoders, multiplexers and de-multiplexers including arithmetic circuits (adders and subtractors).
5. Able to analyze sequential digital circuits like flip-flops, registers, counters and sequence generators.

LIST OF EXPERIMENTS

<table>
<thead>
<tr>
<th>Experiment No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>Design of combinational logic circuits</td>
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<tr>
<td></td>
<td>i) Truth Table verifications of various IC gates</td>
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<td>ii) Simplification, realization of Boolean expressions using logic gates/Universal gates</td>
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<td>2</td>
<td>Code converters using logic gates</td>
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<tr>
<td></td>
<td>i) Realization of BCD to Excess-3 code conversion and vice versa</td>
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<td>ii) Realization of Binary to Gray code conversion and vice versa</td>
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<td>Adder/Subtractor using logic gates</td>
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<tr>
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<td>i) Realization of Half/Full adder</td>
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ii) Realization of Half/Full Subtractors

4 Adder/Subtractor- using IC7483
   i) Realization of Parallel Adder/Subtractor
   ii) Realization of One digit BCD adder

5 Comparators
   i) Realization of One/Two bit comparator( using logic gates)
   ii) Study of magnitude Comparator (using IC7485)

6 Encoder/Decoder
   i) Octal to Binary Encoder, priority encoder
   ii) Use of Decoder chip(IC 7446) to drive LED display

7 MUX/DEMUX – using IC74153/ IC 74139
   i) Arithmetic circuits (Half/Full adder and Half/Full Subtractors)
   iii) Code converter (BCD to Excess-3,Binary to Gray)

8 Truth Table Verification of Flip-Flops
   i) D flip- flop
   ii) T flip- flop
   iii) JK Master slave flip-flop

9 Shift Register Operations – using IC 7495
   i) Shift Left, Shift Right
   ii) SIPO, SISO
   iii) PIPO, PISO

10 Design and Testing of Ring counter/Johnson counter
   i) Using shift register IC 7495
   ii) Using JK Flip Flop IC 7476

11 Design of Sequential Counters
   i) Realization of 3 bit counters using IC 7476
   ii) MOD-N counter design using IC7490, IC74192, IC74193

12 Sequence Generator using IC 7495

NOTE: Use discrete components to conduct the above experiments. Simulations can be done using Open source Software.

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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.

This document provides the syllabus and evaluation framework for Individual Effectiveness Labs (IEL).

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INDIVIDUAL EFFECTIVENESS LABS (IEL)

Sub Code: 14EC308
Credits: 02
Hrs / Week: 0+0+3+0

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. 8 Hours

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
• 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.
PROBABILITY THEORY AND NUMERICAL METHODS

Sub Code : 14EC401          Credits : 04
Hrs/Week : 4+0+0+0          Total Hours: 52

Course Outcomes:

At the end of the course the student should be able to

1. Understand and appreciate the application of statistics in data collection and analysis.
2. Understand and appreciate the application of Probability distributions.
3. Apply numerical methods to solve engineering problems where the Analytical solutions are not possible.
4. Develop a thorough understanding of the principles of Numerical Methods.
5. Identify the suitable numerical methods to solve the problems which occur in engineering and real world problems involving large system of equations, nonlinearities and complicated geometries.
6. Formulate problems in terms of mathematical equations from the Engineering/physical problems.
7. Identify and formulate parabolic, hyperbolic and elliptic partial differential equations and solve by grid analysis.
8. Understand and appreciate the series solution technique of solving linear equations with variable coefficients-Frobenius method.
9. Understand the importance of Bessel and Legendre’s polynomial in engineering problems.

UNIT – I
Probability: 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 Hours

UNIT - II
Probability distributions and Two dimensional random variable: Binomial, Poisson, Normal, and Exponential distributions. Two and higher dimensional random variables, Joint probability distributions,
marginal distributions. Expectation, covariance and correlation coefficient. 10 Hours

UNIT - III


UNIT - IV


UNIT – V

Series solution of Ordinary Differential equations and Special functions: Series solution-Frobenius method, Series solution of Bessel’s D.E leading to Bessel function of first kind. 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. The generating function for P_n(x). Orthogonality of Legendre polynomials. 8 Hours

TEXT BOOKS:

REFERENCE BOOKS:


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LINEAR INTEGRATED CIRCUITS & APPLICATIONS

Sub Code : 14EC402  Credits : 04
Hrs/Week : 4+0+0+0  Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to
1. Understand and analyze the different circuit stages involved in the construction of Op-Amps.
2. Get a firm grounding in the analysis and design of basic circuitry using Op-Amps.
3. Be skilled in understanding, the need for voltage regulation and design regulators using IC regulators.
4. Understand and appreciate the use of Active filters and design basic filters using Op-Amps.
5. Analyze and design circuits using Timer IC, and also know its application in Phase Locked Loops.

UNIT -I

Differential Amplifier: Analysis of differential amplifier, common mode and differential mode gains, transfer characteristics, CMRR, I/P and O/P impedances, high performance amplifiers using current source bias and current mirror connection.

Drift Problem: Thermal drift, input error signals and their compensation in differential amplifier.

Operational Amplifier: Ideal op-amp characteristics, cascading of differential amplifier, I/P, O/P stages and level translators, multistage op-amps, frequency response and stability, frequency and phase compensation techniques

UNIT- II

Op-Amp Applications: Differential amplifier, V to I and I to V converters, log and anti log amplifiers, Sample and Hold circuits, peak detectors, precision rectifiers, instrumentation amplifier using 2 opamps and 3 opamps, R-2R Ladder D/A converters, flash converter.


12 Hours
UNIT- III
Voltage Regulators: Analysis and design of series and shunt regulators, some commercial voltage regulators (78XX series, 723), high current negative voltage with fold back limiting concepts, switching regulators-basics concepts and applications. 8 Hours

UNIT- IV
Active RC Filters: First and second order Butterworth filters and its response -LP, HP, BP, BE, narrow band Filters, Higher order Low Pass Filter, Butterworth LPF of second and higher order, Twin –T Notch Filter, All pass filter, State variable Filters, Switched Capacitor Filters, Switched Capacitor Integrator. 8 Hours

UNIT -V
Timers IC 555: Basic timer circuit, 555 timer used as astable and monostable multivibrator, schmitt trigger, VCO, Linear Ramp generator, FSK generator
Phase Locked Loops: Basic PLL, Phase detector/comparator ,VCO, application of PLL for AM, FM detection, FSK decoder, frequency synthesis using commercial PLLs (565 and 566).
Noise in Opamp circuits: Interference and Inherent noise, Signal to Noise ratio, Noise properties, Sources of noise, opamp noise. 12 Hours

TEXT BOOKS:

REFERENCE BOOKS:
New Age International Limited Publishers.

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ELECTRONIC MEASUREMENTS AND TRANSDUCERS

Sub Code : 14EC403  
Credits : 04
Hrs/Week : 4+0+0+0  
Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. Understand the errors in measurement and their rectification
2. Use the various measuring techniques available.
3. Make out the importance of signal generators and signal analyzers I measurements
4. Make an appropriate selection of sensing devices for particular process

UNIT- I
Introduction to Electronic Instrumentation and Measurements:
Performance characteristics of an instrument, static characteristics, error in measurement, Types of static error, Dynamic characteristics. Bridge circuits – DC Bridges (Wheat stone’s bridge, Kelvin’s Bridge), AC Bridges (comparison Bridge, Maxwell’s Bridge, Hay’s Bridge, Schering’s Bridge, Wien’s Bridge), Digital Instruments- Digital Multimeter, Digital Frequency meter, Digital Time meter.

10 Hours

UNIT- II
DC & AC Measurement: DC Ammeter, Multi range Ammeters, DC Voltmeter, Multirange voltmeter, Loading Effect in DC Voltmeters. AC Voltmeter using rectifiers (Half wave and Full wave), True RMS Voltmeter, Ohmmeter (Series and Shunt). Digital voltmeters- Ramp Technique, Staircase type, Dual slope integrating type, Integrating type, Successive Approximation type.

10 Hours

UNIT-III
Transducers: Principles and classification of transducers, Electrical Transducers- Requirements and Guidelines for selection of Transducers.
Resistive Transducers- Potentiometer, Strain gauges (Types of Strain gauge, Derivation of Gauge Factor), Resistance Thermometer. Inductive Transducers, LVDT. Capacitive Transducer. Piezoelectric Transducer. Photoelectric Transducers- Photo multiplier tube, Photo voltaic cell, Photo Transistor, Photo conductive cell, Photo diode, Photo conductive cell. Temperature Transducer- Thermocouples

UNIT- IV
Display Devices and Recorders: CRO-CRT Features, Block diagram, Vertical Amplifier, Horizontal Deflecting system (Continuous sweep, triggered sweep), Trigger pulse circuit, Delay line circuit. Dual Beam and Dual Trace CRO. Digital storage Oscilloscope. Other display devices- LED, LCD, Electro Luminescent (EL), Electrophoretic Image Display (EPID), and Liquid Vapour Display (LVD) Recorders – Strip chart recorder, XY recorder

UNIT-V

TEXT BOOKS:


REFERENCE BOOK:


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ELECTROMAGNETIC THEORY

Sub Code : 14EC404
Credits : 04
Hrs/Week : 4+0+0+0
Total Hours : 52

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

1. Apply vector calculus to understand the behavior of static electric fields
2. Apply the basic laws that govern electrostatics to the system of charges
3. Apply vector calculus to understand the behavior of static magnetic fields
4. Apply the basic laws that govern magnetostatics to the system of current carrying conductors
5. Understand concepts of time varying fields and laws that govern time varying fields
6. To describe and analyze electromagnetic wave propagation in free space as well as at different boundaries

UNIT- I
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
Electric flux density, Gauss’ law and divergence: Electric flux density, Gauss’ law’ Divergence’ Maxwell’s first equation (Electrostatics), vector operator V and divergence theorem
Energy and Potential: Energy expended 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.

11 Hours

UNIT- II
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.

8 Hours
UNIT- III

Poisson’s and Laplace’s equations: Derivations of Poisson’s and Laplace’s Equations, Uniqueness theorem, Examples of the solutions of Laplace’s and Poisson’s equations.

The steady magnetic field: Biot-Savart law, Ampere’s circuital law, Curl, Stokes’ theorem, magnetic flux and flux density, scalar and vector magnetic potentials

10 Hours

UNIT- IV

Magnetic forces: Forces on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit.

Magnetic materials and inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and mutual Inductance.

11 Hours

UNIT-V

Time varying fields and Maxwell’s equations: Faraday’s law, displacement current, Maxwell’s equation in point and integral form, retarded potentials.

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

12 Hours

TEXT BOOK:


REFERENCE BOOKS:

ANALOG COMMUNICATION

Sub Code : 14EC405  Credits : 04
Hrs/Week : 4+0+0+0  Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. Analyze various types of modulation and demodulation techniques.
2. Model communication system in presence of noise.
3. Analyze the receiver in presence of noise.
4. Visualize applications of communication systems in various fields.
5. Relate theoretical concepts to practical applications.

UNIT - I
Amplitude Modulation: Introduction, Time Domain and Frequency domain description, Generation and Detection of AM, Various types of AM, Generation and Detection of different types of AM (SSB, DSB-SC, VSB) Applications of AM. 12 Hours

UNIT - II
Angle Modulation: Basic Definitions, frequency modulation, narrow band and wide band frequency modulation, Transmission bandwidth of FM, Generation and detection of FM, FM stereo multiplexing, PLL, Nonlinear effects of FM, applications. 12 Hours

UNIT- III
Random Process: Introduction, probability theory, conditional probability, random variables, statistical averages, Random process: stationarity, mean, correlation and co variance functions, power spectral density, Gaussian process. 10 Hours

UNIT- IV
Noise: Introduction, Shot noise, Thermal noise, White noise, Noise equivalent bandwidth, Narrow band noise, Noise figure, Equivalent noise temperature, Signal to noise Ratio, Cascade connection of two port networks Noise factor. 8 Hours
UNIT -V

Noise in Continuous Wave Modulation Systems: Introduction, receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM receivers, Noise in FM receivers, Threshold Effect, pre-emphasis and de-emphasis in FM.  

10 Hours

TEXT BOOK:


REFERENCE BOOK:

DIGITAL SYSTEM DESIGN USING VERILOG

Sub Code : 14EC406  Credits : 04
Hrs/Week : 4+0+0+0  Total Hours : 52

Course Outcomes:

At the end of the course the student should be able to

1. Use Verilog to build complex Digital circuit for simulation and Synthesis.
2. Analyze a Verilog program and understand its purpose.
3. Model complex digital systems at several levels of abstractions: behavioral and structural, synthesis and rapid system prototyping.
4. Develop and simulate register-level models of hierarchical digital systems.
5. Learn how Verilog is used in the process of system realization and how implementation can be done using FPGA.

UNIT -I
Introduction to Verilog: Introduction, conventional approach to digital design, VLSI design, ASIC design flow, Role of HDL.
Introduction to VLSI Design: Conventional Data flow, ASIC data flow, Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools, Test Benches. 8 Hours

UNIT - II
Language Constructs and Conventions: Lexical conventions-Introduction, Keywords and Identifiers, White Space Characters, Comments, Operators, Numbers, Strings Data types-Logic Values, Registers, Strengths, Nets, Scalars and Vectors, Parameters, Memory System Tasks-Displaying information, monitoring information, tasks for control and simulation. Exercises.
 Modules and Ports: Modules, Ports, Rules for connection of ports, connecting port to external signals  

UNIT -III
Modeling at Data Flow Level: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operator types, Examples.

Gate Level Modeling: Introduction, AND Gate Primitive, Module Functions, Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flip-flops with Gate Primitives, Delay, Strengths and Contention Resolution, Net Types, Design of Basic Circuits, Exercises.

UNIT -IV
Behavioral Modeling: Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Examples, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-blocking Assignments, The case statement, Simulation Flow, if and if-else constructs, assign-de assign construct, repeat construct, for loop, the disable construct, while loop, forever loop, sequential and parallel blocks, force-release construct, Event.

Switch Level Modeling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with TriregNets, Exercises.

UNIT - V


TEXT BOOKS:

**REFERENCE BOOKS:**

LINEAR INTEGRATED CIRCUITS & APPLICATIONS LAB

Sub Code : 14EC407  
Credits : 04  
Hrs/Week : 0+0+3+0  
Total Hours : 52

Course Outcomes:

After completing this course students are able to design and test the following circuits for the given specifications by performing experiments or simulation:

1. Linear and Nonlinear applications of Op-Amp
2. Multivibrators using Op-Amp
3. Data converters: DAC and ADC.
4. Voltage regulator using IC regulators.
5. Applications of Timer IC555 and PLL IC.
6. Active filters.

List of Experiments

   a) Inverting and Non – inverting amplifiers.
   b) Inverting & Non inverting Summer/Adder.
   c) Inverting and Non Inverting Zero crossing detector
   d) Differentiator
   e) Inverting Non inverting Integrators
2. Inverting and Non Inverting Schmitt trigger for different hysteresis values using Op-amp.
3. Relaxation Oscillators- astable and monostable multivibrators using Op-amp
5. Data Converters
   a) R -2R N/W DAC using Op – amps
   b) Flash type ADC using Op – amps
6. Voltage Regulators using (a)IC 723 (high / low voltages) (b) IC 78XX
7. Timer IC 555 experiments: Monostable multivibrator, Astable multivibrator, Schmitt trigger ,VCO
8. Butterworth Filter (2\textsuperscript{nd} order): LPF and All pass filter. Use of Lissajous figures.
10. Simulation of Experiments: Butterworth second order HPF, BPF, BEF and 2T- Notch Filter using PSpice/ Orcad or other simulation tools

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DIGITAL SYSTEM DESIGN LAB

Sub Code : 14EC408          Credits : 04
Hrs/Week : 0+0+3+0         Total Hours : 52

Course Outcomes:
At the end of the course the student

1. Should be able to identify the given problem in digital design and try to solve it and write a Verilog code using any styles of coding learnt.
2. Should be able to apply the given problem and write the code using any of the tools available for the design. [For example Xilinx tool which is globally used].
3. Should be able to interface the code written with any hardware boards given by any vendor

List of Experiments

CODING

1. Write a Verilog code to realize all logic gates.
2. Write a Verilog program for combinational designs
3. Develop the Verilog code for flip-flops,
4. Design & testing of binary & BCD counters (Synchronous reset and Asynchronous reset) and “any sequence” counters.

INTERFACING

5. Write Verilog code to display messages on the given seven segment display and accepting
6. Write Verilog code to control speed, direction of DC and Stepper motor.

7. Write Verilog code to generate different waveforms using DAC

8. Write Verilog code to control external lights using relays.