

# FACULTY OF ENGINEERING

## Scheme of Instruction & Examination

(With effect from Academic Year 2025-26)

and

## Syllabi

**B.E. III and IV Semester**

of

**Four Year Degree Programme**

in

**Electronics and Communication Engineering**

(With effect from the academic year 2025-2026)

(As approved in the faculty meeting held on 6<sup>th</sup> June 2025)



Issued by

**Dean, Faculty of Engineering**

**Osmania University, Hyderabad – 500 007**

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**R24**

**SCHEME OF INSTRUCTION & EXAMINATION**  
**B.E. III- Semester**  
**(ELECTRONICS AND COMMUNICATION ENGINEERING)**

| S. No                                | Course Code | Course Title                                 | Scheme of Instruction |          |          |                | Scheme of Examination |            |                 | Credits   |
|--------------------------------------|-------------|--|-----------------------|----------|----------|----------------|-----------------------|------------|-----------------|-----------|
|                                      |             |  | L                     | T        | P/D      | Contact Hrs/Wk | CIE                   | SEE        | Duration in Hrs |           |
| <b>Theory Course</b>                 |             |  |                       |          |          |                |                       |            |                 |           |
| 1                                    | HS 201EG    | Effective Technical Communication in English | 3                     | -        | -        | 3              | 30                    | 70         | 3               | 3         |
| 2                                    | ES 401 EC   | Signals & Systems                            | 3                     | 1        | -        | 4              | 30                    | 70         | 3               | 4         |
| 3                                    | PC 302 EC   | Digital Electronics                          | 3                     | -        | -        | 3              | 30                    | 70         | 3               | 3         |
| 4                                    | PC 303 EC   | Probability Theory and Stochastic Processes  | 3                     | 1        | -        | 4              | 30                    | 70         | 3               | 4         |
| 5                                    | PC 304 EC   | Electronic Devices                           | 3                     | -        | -        | 3              | 30                    | 70         | 3               | 3         |
| 6                                    | PC 305 EC   | Network Theory                               | 3                     | -        | -        | 3              | 30                    | 70         | 3               | 3         |
| <b>Practical / Laboratory Course</b> |             |  |                       |          |          |                |                       |            |                 |           |
| 7                                    | PC 351EC    | Electronic Devices Lab                       | -                     | -        | 2        | 2              | 25                    | 50         | 3               | 1         |
| 8                                    | PC 352EC    | Electronic Workshop Lab                      | -                     | -        | 2        | 2              | 25                    | 50         | 3               | 1         |
| 9                                    | PC353EC     | Logic DesignLab                              | -                     | -        | 2        | 2              | 25                    | 50         | 3               | 1         |
| <b>Total</b>                         |             |  | <b>18</b>             | <b>2</b> | <b>6</b> | <b>26</b>      | <b>255</b>            | <b>570</b> | <b>27</b>       | <b>23</b> |

**PC:** Professional Course**MC:** Mandatory Course**L:**Lecture**T:**Tutorial**P:** Practical**D:**Drawing**G:** Grade(E/VG/G/S/U)**CIE:** Continuous Internal Evaluation    **SEE:** Semester End Examination (Univ. Exam)**Note:**


1. Each contact hour is a Clock Hour
2. The duration of the practical class is two clock hours, however it can be extended wherever necessary, to enable the student to complete the experiment


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| Course Code  | Course Title                                    |   |   |   | Core/PE/OE |     |         |
|--------------|---|---|---|---|------------|-----|---------|
| HS201EG      | EFFECTIVE TECHNICAL COMMUNICATION<br>IN ENGLISH |   |   |   | Core       |     |         |
|              | Contact Hours per Week                          |   |   |   | CIE        | SEE | Credits |
| Prerequisite | L   | T | D | P |            |     |         |
| -            | 3   | - | - | - | 30         | 70  | 3       |

  
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| Course Code  | Course Title           |   |   |   |     | Core/PE/OE |         |
|--|------------------------|---|---|---|-----|------------|---------|
| ES 401 EC  | SIGNALS AND SYSTEMS    |   |   |   |     | Core       |         |
|  | Contact Hours per Week |   |   |   | CIE | SEE        | Credits |
| Prerequisite   | L                      | T | D | P |     |            |         |
| BS201MT  | 3                      | 1 | 0 | 0 | 30  | 70         | 4       |
| <b>Course Objectives:</b> The course is taught with the objectives of enabling the student to:   |                        |   |   |   |     |            |         |
| 1. Analyze basic concepts related to signals and systems.  |                        |   |   |   |     |            |         |
| 2. Familiarize with basic operations on signals and mathematical representation of periodic and aperiodic signals.   |                        |   |   |   |     |            |         |
| 3. Define convolution, correlation operations on continuous signals.   |                        |   |   |   |     |            |         |
| 4. Define the characterization of system using constant coefficient difference equations.  |                        |   |   |   |     |            |         |
| 5. Analyze the response of systems upon application of step and ramp inputs using Fourier and Z transforms   |                        |   |   |   |     |            |         |
| <b>Course Outcomes:</b> On completion of this course, the student will be able to :  |                        |   |   |   |     |            |         |
| 1. Define and differentiate types of signals and systems in continuous and discretetime  |                        |   |   |   |     |            |         |
| 2. Apply the properties of Fourier transform for continuous timesignals  |                        |   |   |   |     |            |         |
| 3. Relate Laplace transforms to solve differential equations and to determine the response of the Continuous Time Linear Time Invariant Systems to knowninputs |                        |   |   |   |     |            |         |
| 4. Apply Z-transforms for discrete time signals to solve Differenceequations   |                        |   |   |   |     |            |         |
| 5. Obtain Linear Convolution and Correlation of discrete time signals with graphical representation  |                        |   |   |   |     |            |         |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 2   | -   | -   | 1   | -   | -   | -   | -   | 1    | -    | 2    |
| CO2 | 3   | 3   | 2   | -   | 2   | -   | -   | -   | -   | 1    | -    | 2    |
| CO3 | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | 2    |
| CO4 | 3   | 3   | 2   | 2   | 2   | -   | -   | -   | -   | 1    | -    | 2    |
| CO5 | 3   | 2   | -   | 2   | 2   | -   | -   | -   | -   | 1    | -    | 2    |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

### UNIT I

**Definitions and classifications:** Classification of continuous time signals. Basic operations on continuous-time signals and classification of continuous-time systems.

**Discrete-time signals and systems:** Sampling, Classification of discrete-time signals, Basic operations on discrete time signals, Basic operations on discrete time signals, Classification of discrete time systems, properties of systems.

### UNIT II

**Representation of Continuous-time signals:** Analogy between vectors and signals, signal representation by a discrete- set of orthogonal functions, orthogonality and completeness. Fourier series – Trigonometric and Exponential Fourier series, computational formulae, symmetry conditions, the complex Fourier spectrum.


|   |
|---|
| <b>Fourier Transform (FT):</b> The direct and inverse FT, existence of FT, Properties of FT, The Frequency Spectrum.  |
| <b>UNIT III</b>   |
| <b>Laplace Transform (LT):</b> The direct LT, Region of convergence, existence of LT, properties of LT. The inverse LT, Solution of differential equations, system transfer function. Linear convolution of continuous time signals: Graphical interpretation, properties of convolution, Correlation between continuous-time signals: Auto and Cross correlation, graphical interpretation, properties of correlation. |
| <b>UNIT IV</b>  |
| <b>Z-Transform:</b> The direct Z transform, Region of convergence, Z-plane and S-plane correspondence. Inverse Z transform, Properties of Z-transforms, Solution to linear difference equations, Linear constant coefficient systems, System transfer function  |
| <b>UNIT V</b>   |
| Discrete Fourier series, Frequency domain Representation of discrete-time systems and signals. Sampling the z-transform. Linear Convolution of discrete time signals: Graphical interpretation, properties of discrete convolution. Correlation between discrete time signals: Auto and Cross-correlation, graphical interpretation, properties of correlation.   |


*Suggested Text Books:*

1. B.P.Lathi, Linear Systems and Signals, Oxford University Press, 2<sup>nd</sup> Edition, 2009
2. Alan V O P Penheim, A. S. Wlisky, Signals and Systems, 2<sup>nd</sup> Edition, Prentice Hall
3. Rodger E. Ziemer, William H Trenter, D. Ronald Fannin, Signals and Systems, 4<sup>th</sup> Edition, Pearson 1998.

*Reference Text Books:*

1. Douglas K. Linder, Introduction to Signals and Systems, McGraw Hill, 1999
2. P. Ramakrishna Rao, Signals and Systems, TMH
3. P. Ramesh Babu, R Ananda Natrajan, Signals and systems SCITECH

  
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| Course Code  | Course Title           |   |   |   |     | Core/PE/OE |         |
|--|------------------------|---|---|---|-----|------------|---------|
| PC302EC  | DIGITAL ELECTRONICS    |   |   |   |     | Core       |         |
|  | Contact Hours per Week |   |   |   | CIE | SEE        | Credits |
| Prerequisite   | L                      | T | D | P |     |            |         |
| BS202PH  | 3                      | - | - | - | 30  | 70         | 3       |
| <b>Course Objectives :</b> The course is taught with the objectives of enabling the student to:                          |                        |   |   |   |     |            |         |
| 1. Understand the fundamental principles of digital hardware design and number systems.                                  |                        |   |   |   |     |            |         |
| 2. Apply Boolean algebra and logic minimization techniques to implement combinational circuits efficiently.              |                        |   |   |   |     |            |         |
| 3. Analyze the functionality and timing characteristics of sequential circuits using various flip-flops and latches.     |                        |   |   |   |     |            |         |
| 4. Design finite state machines (FSMs) for real-time digital applications using synchronous sequential logic.            |                        |   |   |   |     |            |         |
| 5. Explore the architecture and design methodologies using programmable logic devices like PALs, PLAs, CPLDs, and FPGAs. |                        |   |   |   |     |            |         |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :                                     |                        |   |   |   |     |            |         |
| 1. Explain the fundamentals of digital hardware design, logic gates, Boolean algebra, and logic synthesis.               |                        |   |   |   |     |            |         |
| 2. Design and optimize combinational circuits using K-Map and Quine-Mc Cluskey methods.                                  |                        |   |   |   |     |            |         |
| 3. Construct and analyze various sequential circuits including flip-flops, registers, and counters.                      |                        |   |   |   |     |            |         |
| 4. Develop FSM-based digital systems for sequence detection and generation using Mealy/Moore models.                     |                        |   |   |   |     |            |         |
| 5. Implement combinational logic using PLDs such as PALs, PLAs, CPLDs, and FPGAs.  |                        |   |   |   |     |            |         |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 1    |
| CO2 | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | 2    |
| CO3 | 3   | 2   | 3   | 2   | 1   | -   | -   | -   | -   | -    | -    | 2    |
| CO4 | 3   | 2   | 3   | 3   | 1   | -   | -   | -   | -   | -    | -    | 2    |
| CO5 | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | 2    |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

### UNIT I

**Design Concepts:** Digital Hardware, Design process, Design of digital hardware. Number systems and codes. Introduction to logic circuits – Variables and functions, Logic gates and networks. Boolean algebra, Synthesis using gates, Design examples.


### UNIT II


**Logic Optimization:** Optimized implementation of logic functions using K-Map and Quine-Mc Cluskey Tabular method.

**Combinational Circuit Design:** Adders and Subtractors, Multiplexers, Demultiplexers, Parity Checkers and Generators, Decoders, Encoders, Code converters, BCD to 7-segment

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| converter and Arithmetic comparator circuits.  |
| <b>UNIT III</b>  |
| <b>Sequential Circuits:</b> Basic Latch, Gated SR Latch, gated D Latch, Master-Slave edge triggered flip-flops, T Flip-flop, JK Flip-flop, Excitation tables, Timing diagrams and analysis, Flip flop conversions, Set-up and hold time, Registers and Counters. |
| <b>UNIT IV</b>   |
| <b>Synchronous Sequential Circuits:</b> Basic Design Steps, Finite State machine (FSM) representation using Moore and Mealy state models, State minimization, Design of FSM for Sequence Generation and Detection, Algorithmic State Machine charts.             |
| <b>UNIT V</b>  |
| <b>Design of combinational circuits using Programmable Logic Devices (PLDs):</b> General structure of a Programmable Array Logic (PAL), Programmable Logic Arrays (PLAs), Structure of CPLDs and FPGAs, 2-input and 3-input lookup tables (LUTs).                |

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|---|
| <i>Suggested Text Books:</i>  |
| 1. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson, 6/e, 2021.  |
| 2. Zvi Kohavi, "Switching and Finite Automata Theory", 3/e, Cambridge University Press New Delhi, 2011.   |
| 3. R. P Jain, "Modern Digital Electronics", 4/e, McGraw Hill Education (India) Private Limited, 2010.   |
| <i>Reference Text Books:</i>  |
| 1. John F. Wakerly, <i>Digital Design: Principles and Practices</i> , 5th Edition, Pearson Education, 2018.   |
| 2. Ronald J. Tocci, Neal S. Widmer, and Gregory L. Moss, <i>Digital Systems: Principles and Applications</i> , 12th Edition, Pearson Education, 2016. |
| 3. A. Anand Kumar, <i>Fundamentals of Digital Circuits</i> , 4th Edition, PHI Learning, 2016.   |
| 4. Charles H. Roth Jr. and Larry L. Kinney, <i>Fundamentals of Logic Design</i> , 7th Edition, Cengage Learning, 2013.                                |

  
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| Course Code  | Course Title                                |   |   |   |     | Core/PE/OE |         |
|--|---|---|---|---|-----|------------|---------|
| PC 303 EC  | PROBABILITY THEORY AND STOCHASTIC PROCESSES |   |   |   |     | Core       |         |
|  | Contact Hours per Week                      |   |   |   | CIE | SEE        | Credits |
| Prerequisite   | L   | T | D | P |     |            |         |
| BS201MT  | 3   | 1 | - | - | 30  | 70         | 4       |
| <b>Course Objectives :</b> The course is taught with the objectives of enabling the student to:                            |   |   |   |   |     |            |         |
| 1. Understand fundamentals of probability, repeated trials and Baye's theorem.   |   |   |   |   |     |            |         |
| 2. Learn Random variable and distribution and density functions of different variables along with their mean and variance. |   |   |   |   |     |            |         |
| 3. Learn two Random variables along with joint moments and its properties.   |   |   |   |   |     |            |         |
| 4. Understand elementary concepts of the Stochastic Processes and their temporal characteristics                           |   |   |   |   |     |            |         |
| 5. Understand elementary concepts of the Stochastic Processes and their Spectral characteristics                           |   |   |   |   |     |            |         |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :                                       |   |   |   |   |     |            |         |
| 1. Understand axioms of probability and prove some basic theorems of probability.  |   |   |   |   |     |            |         |
| 2. To understand different types of Random variables, their density and distribution functions                             |   |   |   |   |     |            |         |
| 3. To learn bi-variate distributions and the operations on them.   |   |   |   |   |     |            |         |
| 4. To understand elementary concepts of the Stochastic Processes in the Temporal domain.                                   |   |   |   |   |     |            |         |
| 5. To analyze the frequency domain information of Stochastic Processes.  |   |   |   |   |     |            |         |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | 1    | -    | 1    |
| CO2 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | 1    | -    | 1    |
| CO3 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | 1    | -    | 1    |
| CO4 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | 1    | -    | 1    |
| CO5 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | 1    | -    | 1    |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

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|--|
| <b>UNIT I: Concept of Probability</b>  |
| Probability introduced through Set Theory and Operations – Definitions and Axioms, Probability Space – Discrete and Continuous, Events - Mutually Exclusive and independent events, Joint Probability, Conditional Probability, Total Probability & Baye's Theorem, Repeated Trials, Combined Experiments, Bernoulli Trials, Bernoulli's Theorem.  |
| <b>UNIT II: Random Variable, Distribution &amp; Density Functions</b>  |
| <b>Random Variable:</b> Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.   |
| <b>Distribution &amp; Density Functions and Operations on One Random Variable</b>  |
| Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Gamma, Rayleigh Distribution functions, Conditional Density and its Properties. Expected Value of a Random Variable, Function of a Random Variable $g(x)$ and its distribution, Moments about the Origin, Central Moments and Variance, Characteristic Function, Moment Generating Function. |
| <b>UNIT-III: Two Random Variables and operations</b>   |
| Bi-Variate Distributions: Joint Distribution and Density Function and their properties, Joint  |

Moments, Co-Variance, Correlation and Degree of Correlation, Joint Characteristic Functions, Conditional Distributions, Conditional Expected Values. Central Limit Theorem (no proof). One Function of Two Random Variables, Two functions of two random variables.

#### UNIT-IV Stochastic Processes – Temporal Characteristics

##### Stochastic Processes – Temporal Characteristics

Definitions and types of Stochastic Processes, Introduction to stationarity (First, Second and  $n^{\text{th}}$  order), Wide Sense and Strict Sense Stationary Processes, Statistical independence, Time averages and ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties.

#### UNIT-V Stochastic Processes – Spectral Characteristics

##### Stochastic Processes – Spectral Characteristics



Power Spectral Density and its properties; Relationship between Power Spectrum and Autocorrelation Function; Relationship between Cross-Power Spectrum and Cross-Correlation Function; White and colored noise, Linear Systems, Response to linear systems for stochastic inputs, Introduction to Gaussian, Poisson and Markov Processes.


#### Suggested Text Books:

1. Henry Stark and John W. Woods, *Probability and Random Processes with Application to Signal Processing*, 3<sup>rd</sup> edition, Pearson Education, 2014.
2. Athanasius Papoulis and S. Unnikrishna Pillai, *Probability, Random Variables and Stochastic Processes*, 4<sup>th</sup> edition, McGraw Hill, 2006.
3. Peyton Z. Peebles, *Probability, Random Variables & Random Signal Principles*, 4<sup>th</sup> edition, Tata McGraw Hill, 2001.

#### Reference Text Books:

1. T Veerarajan, *Probability, Statistics and Random Processes*, McGraw Hill, 3<sup>rd</sup> edition
2. P Sri Hari, *Probability and Random Variables*, The Hi-Tech Publishers

  
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| Course Code  | Course Title                  |          |          |            |            | Core/PE/OE  |                |
|--|-------------------------------|----------|----------|------------|------------|-------------|----------------|
| PC 304 EC  | <b>ELECTRONIC DEVICES</b>     |          |          |            |            | <b>Core</b> |                |
|  | <b>Contact Hours per Week</b> |          |          |            | <b>CIE</b> | <b>SEE</b>  | <b>Credits</b> |
| <b>Prerequisite</b>  | <b>L</b>                      | <b>T</b> | <b>D</b> | <b>P/D</b> |            |             |                |
| <b>BS301EE</b>   | <b>3</b>                      | <b>-</b> | <b>-</b> | <b>-</b>   | <b>30</b>  | <b>70</b>   | <b>3</b>       |
| <b>Course Objectives :</b> The course is taught with the objectives of enabling the student to:  |                               |          |          |            |            |             |                |
| 1. Study semiconductor physics and Analyze the behavior of Semiconductor diodes in Forward and Reverse bias.   |                               |          |          |            |            |             |                |
| 2. Develop Half wave and Full wave rectifiers with L, C Filters.   |                               |          |          |            |            |             |                |
| 3. Explain V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations and Design of DC Biasing techniques  |                               |          |          |            |            |             |                |
| 4. Design and analysis of small signal transistor amplifiers using exact and simplified hybrid models. Design and application of special devices like UJT, SCR, DIAC, TRIAC, and CCD |                               |          |          |            |            |             |                |
| 5. Explore V-I Characteristics , Biasing techniques, small signal model of FET's and MOSETS.   |                               |          |          |            |            |             |                |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :   |                               |          |          |            |            |             |                |
| 1. Analyze the behavior of semiconductor diodes in forward and reverse bias  |                               |          |          |            |            |             |                |
| 2. Develop Half wave and Full wave rectifiers with L,C,LC & CLC Filters  |                               |          |          |            |            |             |                |
| 3. Explain V-I characteristics of Bipolar Junction Transistor in CB,CE& CC configurations and Design DC Biasing techniques   |                               |          |          |            |            |             |                |
| 4. Design Biasing techniques for BJT in Amplifier Applications   |                               |          |          |            |            |             |                |
| 5. Explore V-I characteristics, analyze Amplifier configurations and Biasing circuits of FET and MOSFETS.  |                               |          |          |            |            |             |                |

|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> | 3   | 2   | 1   | 2   | -   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO2</b> | 3   | 1   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO3</b> | 3   | 3   | 2   | 1   | -   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO4</b> | 3   | 2   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO5</b> | 3   | 3   | 1   | 2   | -   | -   | -   | -   | -   | -    | -    | -    |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

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|--|
| <b>UNIT I</b>  |
| <b>Junction Diode :</b> Different types of PN Junction formation techniques, PN Junction Characteristics, biasing- band diagrams and current flow, Diode current equations under forward bias and reverse bias conditions, Junction breakdown in diodes and breakdown voltages, effect of temperature on diode characteristics, Diode as a circuit element, small signal diode models, Junction capacitance under forward bias and reverse bias, Diode switching characteristics, Zener Diodes, Zener voltage regulator and its limitation |
| <b>UNIT II</b>   |
| <b>PN Diode Applications:</b> Half wave, Full wave and Bridge rectifiers - their operation, performance characteristics, and analysis; Filters (L, C, LC and CLC filters) used in power supplies and their ripple factor calculations, design of Rectifiers with and without Filters.  |
| <b>UNIT III</b>  |
| <b>Bipolar Junction Transistor :</b> Transistor Junction formation (collector-base, base-emitter Junctions) Transistor biasing-band diagram for NPN and PNP transistors, current   |

components and current flow in BJT, Modes of transistor operation, Early effect, BJT input and output characteristics in CB, CE CC configurations, BJT as an amplifier, BJT biasing techniques, Thermal runaway, heat sinks and thermal stabilization, operating point stabilization against temperature and device variations, stability factors, Bias stabilization and compensation techniques, Biasing circuit design.

#### UNIT IV

**Small Signal Transistors equivalent circuits:** Small signal low frequency h-parameter model of BJT, Determination of h parameters, analysis of BJT amplifiers using h-parameter, comparison of CB, CE and CC amplifier configurations, Analysis of BJT amplifier with approximate model. Introduction to low frequency  $\Pi$  and T models  
**Special Devices:** Working of photo diode, solar cells, LED.

#### UNIT V



**Junction Field Effect Transistors (JFET):** JFET formation, operation & current flow, pinch-off voltage, V-I characteristics of JFET. JFET biasing-zero current drift biasing, biasing against device variations. Low frequency small signal model of FETs. Analysis of CS, CD and CG amplifiers and their comparison. FET as an amplifier and as a switch.  
**MOSFETs:** MOSFETs, Enhancement & Depletion mode MOSFETs, V-I characteristics.


#### Suggested Text Books:

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, *Electronic Devices and Circuits*, 3<sup>rd</sup> ed., McGraw Hill Education, 2010
2. Robert Boylestad and Louis Nashelsky, *Electronic Devices and Circuit Theory*, 11<sup>th</sup> ed., Pearson India Publications, 2015
3. S Salivahanan, N Kumar, and A Vallavaraj, *Electronic Devices and Circuits*, 2nd ed., McGraw Hill Education, 2007.

#### Reference Text Books:

1. David A. Bell, *Electronic Devices and Circuits*, 5<sup>th</sup> ed., Oxford University Press, 2009.
2. JB Gupta, *Electronic Devices and Circuits*, S.K Kataria & sons, 5th Edition, 2012
3. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press
4. *Electronic Devices and Circuits*, A.P Godse, U.A Bakshi, Technical Publications

  
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 Road No: 3, Banjara Hills Hyderabad-34

| Course Code   | Course Title           |   |   |   |     | Core/Elective |         |
|---|------------------------|---|---|---|-----|---------------|---------|
| PC 305 EC   | NETWORK THEORY         |   |   |   |     | Core          |         |
| Prerequisite  | Contact Hours per Week |   |   |   | CIE | SEE           | Credits |
|   | L                      | T | D | P |     |               |         |
| ES154EE<br>BS102MT  | 3                      | - | - | - | 30  | 70            | 3       |
| <b>Course Objectives :</b> The course is taught with the objectives of enabling the student to:   |                        |   |   |   |     |               |         |
| 1. Concepts of Two Port networks, study about the different two port parameter representations.   |                        |   |   |   |     |               |         |
| 2. Concepts about the image impedance on different networks, design of attenuators.   |                        |   |   |   |     |               |         |
| 3. Design concepts of equalizers.   |                        |   |   |   |     |               |         |
| 4. Design concepts of different filters.  |                        |   |   |   |     |               |         |
| 5. Design concepts of network synthesis   |                        |   |   |   |     |               |         |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :  |                        |   |   |   |     |               |         |
| 1. Able to Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and Solve the circuits and how they are used in real time applications. |                        |   |   |   |     |               |         |
| 2. Able to learn how to calculate properties of networks and design of attenuators.   |                        |   |   |   |     |               |         |
| 3. Able to design of equalizers   |                        |   |   |   |     |               |         |
| 4. Able to design different types of filters using passive elements.  |                        |   |   |   |     |               |         |
| 5. Able to synthesize the RL & RC networks in Foster and Cauer Forms.   |                        |   |   |   |     |               |         |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    |
| CO2 | 3   | 3   | 2   | 2   | -   | 2   | -   | -   | -   | -    | -    | 2    |
| CO3 | 3   | 3   |     | 2   | -   | -   | -   | -   | -   | -    | -    |      |
| CO4 | 2   | 2   | -   | -   | -   | 2   | 2   | -   | -   | -    | -    | 2    |
| CO5 | 2   | -   | -   | -   | -   | 2   | 2   | -   | -   | -    | -    |      |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

|   |
|---|
| <b>UNIT I</b>   |
| <b>Two Port networks:</b> Z, Y, h, g and ABCD parameters, equivalence of two ports networks, T- $\pi$ transforms, Reciprocity theorem, Interconnection of two port networks and Brune's test for inter connections.   |
| <b>UNIT II</b>  |
| <b>Symmetrical and Asymmetrical Networks:</b> Characteristic impedance and propagation constant of symmetrical T and $\pi$ networks, Image and iterative impedances, Image transfer constant and iterative transfer constant of asymmetrical L, T and $\pi$ networks, |
| <b>UNIT III</b>   |
| <b>Constant k- Filters-</b> Low pass, high pass, band pass and band elimination filter design, m-derived low pass and high pass filter design, Composite filter design and notch filter.  |
| <b>UNIT IV</b>  |
| <b>Attenuators and Equalizers-</b> Design of symmetrical T, $\pi$ , Bridge-T and Lattice attenuators, impedance matching networks, Inverse networks, Equalizers, Constant resistance equalizer,   |

|                                       |
|---------------------------------------|
| full series and full shunt equalizer. |
|---------------------------------------|

|               |
|---------------|
| <b>UNIT V</b> |
|---------------|


|   |
|---|
| <b>Network Synthesis:</b> Hurwitz polynomials, positive real functions, Basic Philosophy of Synthesis, L-Immittance functions, RC impedance functions and RL admittance functions. RL impedance functions and RC admittance functions. Cauer and Foster's forms of RL impedance and RC admittance. Properties of RC, RL Networks. |
|---|


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|------------------------------|
| <i>Suggested Text Books:</i> |
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- |  |
|--|
| 1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 6th edition, Tata McGraw-Hill, 2007.  |
| 2. A Sudhakar and Shyammoan S Palli, "Circuits & Networks: Analysis and Synthesis", 3 <sup>rd</sup> ed., Tata McGraw-Hill, 2007. |
| 3. A. Sudhakar Shyammoan, <i>Circuits Networks: Analysis Synthesis</i> , 4th edition, Tata McGraw-Hill, 2010.                    |

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| <i>Reference Text Books:</i> |
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- |   |
|---|
| 1. Ryder J.D, <i>Network Lines Fields</i> , 2nd edition, Prentice Hall of India, 1991.                                      |
| 2. P.K. Jain and Gurbir Kau, <i>Networks, Filters and Transmission Lines</i> , Tata McGraw-Hill Publishing Company Limited. |
| 3. Van Valkenburg M.E, <i>Introduction to Modern Network Synthesis</i> , Wiley Eastern 1994.                                |
| 4. S.P. Ghosh and A.K. Chakraborty, <i>Network Analysis and Synthesis</i> , McGraw Hill, 1 <sup>st</sup> edition, 2009.     |

  
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| Course Code  | Course Title                               |          |          |          |            | Core/PE/OE  |                |
|--|--|----------|----------|----------|------------|-------------|----------------|
| PC 351 EC  | <b>ELECTRONIC DEVICES AND CIRCUITS LAB</b> |          |          |          |            | <b>Core</b> |                |
|  | <b>Contact Hours per Week</b>              |          |          |          | <b>CIE</b> | <b>SEE</b>  | <b>Credits</b> |
| <b>Prerequisite</b>  | <b>L</b>                                   | <b>T</b> | <b>D</b> | <b>P</b> |            |             |                |
| <b>PC304EC</b>   |  |          |          | <b>2</b> | <b>25</b>  | <b>50</b>   | <b>1</b>       |
| <b>Course Objectives :</b> The course is taught with the objectives of enabling the student to:              |  |          |          |          |            |             |                |
| 1. To learn the characteristics of Semiconductor diodes  |  |          |          |          |            |             |                |
| 2. To design the filters and rectifiers with and without capacitors.   |  |          |          |          |            |             |                |
| 3. Demonstrate the characteristics of different transistor Configurations                                    |  |          |          |          |            |             |                |
| 4. Design of Biasing Circuits for BJT and FET Amplifiers   |  |          |          |          |            |             |                |
| 5. To develop simulation skills using tools to model and analyze diode and rectifier circuits.               |  |          |          |          |            |             |                |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :                         |  |          |          |          |            |             |                |
| 1. Demonstrate the characteristics of Semiconductor diodes   |  |          |          |          |            |             |                |
| 2. Realize the filters and rectifiers with and without capacitors.   |  |          |          |          |            |             |                |
| 3. Demonstrate the characteristics of different transistor Configurations                                    |  |          |          |          |            |             |                |
| 4. Design of Biasing Circuits for BJT and FET Amplifiers   |  |          |          |          |            |             |                |
| 5. Design and simulate diode-based circuits and rectifier systems using electronic circuit simulation tools. |  |          |          |          |            |             |                |


|            | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| <b>CO1</b> | 3   | 2   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO2</b> | 3   | 2   | 3   | 2   | 1   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO3</b> | 3   | 2   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO4</b> | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | -    |
| <b>CO5</b> | 2   | 3   | 2   | 3   | 3   | -   | -   | -   | -   | -    | -    | -    |


Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.


| <b>List of Experiments</b>   |
|--|
| 1. V-I Characteristics of Silicon and Germanium diodes and measurement of static and dynamic resistances                   |
| 2. Zener diode characteristics and its application as voltage regulator  |
| 3. Design, realization and performance evaluation of half wave rectifiers without filters and with LC & pi section filters |
| 4. Design, realization and performance evaluation of full wave rectifiers without filters and with LC & pi section filters |
| 5. Plotting the characteristics of BJT in Common Base configuration and measurement of h-parameters                        |
| 6. Plotting the characteristics of BJT in Common Emitter configuration and measurement of h-parameters                     |
| 7. Plotting the characteristics of JFET in CS configuration and measurement of Trans-conductance and Drain resistance      |
| 8. BJT biasing circuits , Fixed Biasing, Collector to base bias and Self bias  |
| 9. Design and Simulation of the V-I characteristics of a PN junction diode and Zener diode.                                |
| 10. Design and Simulation of Half-wave and Full-wave rectifier circuits with and without filters                           |

**Suggested Text Books:**

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, *Basic Electronics, A Text - Lab Manual*, 7<sup>th</sup>ed., McGraw Hill Education, 2001.
2. David Bell, *Fundamentals of electronic devices and circuits Lab Manual*, 5<sup>th</sup> ed., Oxford university press, 2009.
3. R.C. Jaeger & T. N. Blalock, *Micro Electronic circuit design*, 4<sup>th</sup> ed., Mc Graw Hill Higher Education, 2011.

  
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| Course Code   | Course Title            |   |   |   |     | Core/PE/OE |         |
|---|-------------------------|---|---|---|-----|------------|---------|
| PC 352EC  | ELECTRONIC WORKSHOP LAB |   |   |   |     | Core       |         |
|   | Contact Hours per Week  |   |   |   | CIE | SEE        | Credits |
| Prerequisite  | L                       | T | D | P |     |            |         |
| BS202PH   |                         |   |   | 2 | 25  | 50         | 1       |
| <b>Course Objectives :</b> The course is taught with the objectives of enabling the student to:                           |                         |   |   |   |     |            |         |
| 1. To identify and understand the function of basic electronic components and measurement tools.                          |                         |   |   |   |     |            |         |
| 2. To develop hands-on skills in soldering and PCB design.  |                         |   |   |   |     |            |         |
| 3. To verify fundamental theorems of electrical networks using hardware.  |                         |   |   |   |     |            |         |
| 4. To verify key network theorems both through hardware implementation and SPICE simulation.                              |                         |   |   |   |     |            |         |
| 5. To analyze and simulate electrical circuits to measure and interpret network parameters and resonance characteristics. |                         |   |   |   |     |            |         |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :                                      |                         |   |   |   |     |            |         |
| 1. Identify and classify active, passive components, and use basic electrical measurement tools.                          |                         |   |   |   |     |            |         |
| 2. Demonstrate basic soldering, de-soldering skills, and design simple PCB layouts.                                       |                         |   |   |   |     |            |         |
| 3. Apply and verify fundamental electrical theorems.  |                         |   |   |   |     |            |         |
| 4. Measure and analyze two-port parameters, image impedance, and characteristic impedance using appropriate test setups.. |                         |   |   |   |     |            |         |
| 5. Simulate and verify resonance conditions in electrical circuits using SPICE and analyze their frequency response.      |                         |   |   |   |     |            |         |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 2   | 2   | 1   | 1   | -   | -   | -   | -   | -    | -    | 1    |
| CO2 | 2   | 3   | 2   | -   | 2   | -   | -   | -   | -   | -    | -    | 2    |
| CO3 | 3   | 2   | 3   | 2   | 1   | -   | -   | -   | -   | -    | -    | 1    |
| CO4 | 3   | 2   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | 2    |
| CO5 | 2   | 2   | 2   | 1   | 2   | -   | -   | -   | -   | -    | -    | 1    |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

| <b>List of Experiments</b>   |
|--|
| 1. Study of all types of discrete Active & passive devices, display devices, integrated components, electro mechanical components (switches, sockets, connectors etc.) electromagnetic components (relays). Study and use of different meters (volt/ammeter, AVO/Multi meter) for the measurement of electrical parameters. Measurement of RLC components using LCR Meter. |
| 2. Soldering and Desoldering.  |
| 3. PCB design and circuit assembling   |
| 4. Study of CRO and its applications.  |
| 5. Design and Verification of Superposition and Tellegan's theorem   |
| 6. Design and Verification of Thevenin's and Maximum Power Transfer Theorem.   |
| 7. Measurement of two-port network parameters.   |
| 8. Measurement of Image impedance and Characteristics impedance.   |
| 9. Design and Verification of SPICE simulation of Superposition and Tellegan's theorem.  |
| 10. Design and Verification of SPICE simulation of Thevenin's and Maximum Power Transfer.  |

|   |
|---|
| 11.Design and Verification of SPICE simulation of Series Resonance. |
|---|


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| 12.Design, Verification of SPICE simulation of Parallel Resonance. |
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|                              |
|------------------------------|
| <i>Suggested Text Books:</i> |
|------------------------------|


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|---|
| 1. David A. Bell, <i>Electronic Devices and Circuits Lab Manual</i> , 5th Edition, Oxford University Press, 2014. |
|---|

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| 2. Zbar, Malvino, and Miller, <i>Basic Electronics: A Text-Lab Manual</i> , McGraw Hill Education, 1993. |
|--|

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| 3. A. Sudhakar and Shyammohan S. Palli, <i>Circuits and Networks: Analysis and Synthesis</i> , 5th Edition, McGraw Hill Education, 2015. |
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| Course Code   | Course Title           |   |   |   |     | Core/PE/OE |         |
|---|------------------------|---|---|---|-----|------------|---------|
| PC 353EC  | LOGIC DESIGN LAB       |   |   |   |     | Core       |         |
|   | Contact Hours per Week |   |   |   | CIE | SEE        | Credits |
| Prerequisite  | L                      | T | D | P |     |            |         |
| ES301EE   |                        |   |   | 2 | 25  | 50         | 1       |
| <b>Course Objectives:</b> The course is taught with the objectives of enabling the student to:                          |                        |   |   |   |     |            |         |
| 1. To understand and verify the functionality of basic logic gates and standard combinational logic circuits.           |                        |   |   |   |     |            |         |
| 2. To design and realize combinational circuits using universal gates, multiplexers, and decoders.                      |                        |   |   |   |     |            |         |
| 3. To verify and analyze the operation of various flip-flops and their conversions.                                     |                        |   |   |   |     |            |         |
| 4. To design and simulate sequential circuits including counters and shift registers using simulation tools.            |                        |   |   |   |     |            |         |
| 5. To introduce students to the basics of PCB design using CAD tools for digital/analog circuits.                       |                        |   |   |   |     |            |         |
| <b>Course Outcomes :</b> On completion of this course, the student will be able to :                                    |                        |   |   |   |     |            |         |
| 1. Verify the truth tables of basic logic gates and implement simple code converters using logic gates.                 |                        |   |   |   |     |            |         |
| 2. Design and implement half and full adders/subtractors using universal gates, MUX, and decoders.                      |                        |   |   |   |     |            |         |
| 3. Analyze the working of different flip-flops and perform flip-flop conversions to implement required memory elements. |                        |   |   |   |     |            |         |
| 4. Simulate combinational and sequential logic circuits using digital design tools to validate logical functionality    |                        |   |   |   |     |            |         |
| 5. Create and simulate PCB layouts for simple analog/digital circuits using PCB design tools.                           |                        |   |   |   |     |            |         |

|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | 3   | 2   | 2   | 2   | 3   | -   | -   | -   | -   | -    | -    | 1    |
| CO2 | 3   | 3   | 3   | 2   | 3   | -   | -   | -   | -   | -    | -    | 2    |
| CO3 | 3   | 3   | 2   | 3   | 3   | -   | -   | -   | -   | -    | -    | 2    |
| CO4 | 2   | 3   | 2   | 3   | 3   | -   | -   | -   | -   | -    | -    | 1    |
| CO5 | 3   | 2   | 3   | 2   | 3   | -   | -   | -   | -   | -    | -    | 1    |

Correlation rating: Low / Medium / High: 1 / 2 / 3 respectively.

| <b>List of Experiments:</b>  |
|--|
| 1. Verification of truth tables of Logic gates and realization of Binary to Gray and Gray to Binary code converters. |
| 2. Realization of Half adder/subtractor using universal logic gates.   |
| 3. Realization of Full adder/subtractor using universal logic gates.   |
| 4. Realization of Full adder/Sub using MUX and Decoder   |
| 5. Verification of truth tables of Flip Flops and Flip flop conversions form one form to the other.                  |
| 6. Design and simulation of basic logic gates and verification of their truth tables.                                |
| 7. Design and simulation of Combinational circuits such as adders, subtractors, multiplexers, and demultiplexers     |


- |  |
|--|
| 8. Design and Simulation of Sequential Circuits such as JK and D Flip Flops.         |
| 9. Design and Simulation of Sequential Circuits such as Counters and Shift Registers |
| 10. Design a simple PCB layout for a given analog/digital circuit using CAD tools.   |


Note:


The Preferred Simulation Tools are LTspice – for analog circuit simulation, Multisim /PSpice – for analog and mixed-signal circuit simulation, Logisim – for basic digital logic circuits.

*Suggested Text Books:*

- |   |
|---|
| 1. David A. Bell, Lab Manual for Electronic Devices and Circuits, 4th Edition, PHI.                           |
| 2. Zbar, Malvino, Miller, Basic Electronics: A Text Lab Manual.   |
| 3. M. H. Rashid, SPICE for Circuits and Electronics Using PSpice, Pearson.                                    |
| 4. A. Sudhakar and Shyammohan S. Palli, Circuits and Networks: Analysis and Synthesis, McGraw Hill Education. |

  
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