R 25

HYDERABAD

Indian in Character International in Excellence

SYLLABUS BOOK

Department of

ELECTRONICS & COMMUNICATION ENGINEERING (ECE)

Bachelor of Technology (B.Tech)

(R25 Regulations)

Applicable to Regular students admitted from A.Y. 2025–26 onwards and Lateral Entry students from A.Y. 2026–27 onwards.

Up to II **B.Tech,** II **Semester**

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

Medbowli, Meerpet, Hyderabad - 500097, Telangana, India

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE STRUCTURE (R 25)

B.Tech. I Year I Semester: ECE							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Remarks if any**
1.	25MA101BS	Matrices and Calculus	3	1	0	4	
2.	25PH102BS	Advanced Engineering Physics	3	0	0	3	
3.	25CS105ES	Programming for Problem Solving	3	0	0	3	
4.	25EE102ES	Introduction to Electrical Engineering	2	0	0	2	
5.	25ME105ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3	
6.	25EN103HS	English for Skill Enhancement	3	0	0	3	
7.	25PH106BS	Advanced Engineering Physics Lab	0	0	2	1	
8.	25CS107ES	Programming for Problem Solving Lab	0	0	2	1	
9.	25EN108HS	English Language and Communication Skills Lab	0	0	2	1	
		Induction Program					
		Total Credits	**16**	**1**	**08**	**21**	

B.Tech. I Year II Semester: ECE							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Remarks if any**
1.	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3	
2.	25CH202BS	Engineering Chemistry	3	0	0	3	
3.	25CS203ES	Python Programming	3	0	0	3	
4.	25CS205ES	Data Structures	3	0	0	3	
5.	25EE201ES	Network Analysis and Synthesis	3	0	0	3	
6.	25CH206BS	Engineering Chemistry Lab	0	0	2	1	
7.	25EC207ES	Applied Python Programming Lab	0	0	2	1	
8.	25CS207ES	Data Structures Lab	0	0	2	1	
9.	25EE207ES	Basic Electrical Engineering Lab	0	0	2	1	
10.	25ME209ES	Engineering Workshop	0	0	2	1	
		Total Credits	**15**	**0**	**10**	**20**	

B.Tech. II Year I Semester: ECE							
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Remarks if any**
1.	25EC301PC	Probability Theory and Stochastic Processes	3	0	0	3	
2.	25EC302PC	Signals and Systems	3	0	0	3	
3.	25EC303PC	Electronic Devices and Circuits	3	0	0	3	
4.	25EC304PC	Digital Logic Design	3	0	0	3	
5.	25EC305PC	Control Systems	2	0	0	2	
6.	25MS306HS	Innovation and Entrepreneurship	2	0	0	2	
7.	25EC307PC	Modelling and Simulation Lab	0	0	2	1	
8.	25EC308PC	Electronic Devices and Circuits Lab	0	0	2	1	
9.	25EC309PC	Digital Logic Design Lab	0	0	2	1	
10.	25EC310SD	Linux and Shell Scripting	0	0	2	1	
11.	25VA300ES	Environmental Science	1	0	0	1	
		Total Credits	**17**	**0**	**08**	**21**	

B.Tech. II Year II Semester: ECE							
S. No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**	**Remarks if any**
1.	25MA401BS	Numerical Methods and Complex Variables	3	0	0	3	
2.	25EC402PC	Electromagnetic Fields and Transmission Lines	3	0	0	3	
3.	25EC403PC	Analog and Digital Communications	3	0	0	3	
4.	25EC404PC	Electronic Circuit Analysis	3	0	0	3	
5.	25EC405PC	Linear and Digital IC Applications	3	0	0	3	
6.	25MA406PC	Computational Mathematics Lab	0	0	2	1	
7.	25EC407PC	Analog and Digital Communications Lab	0	0	2	1	
8.	25EC408PC	Electronic Circuit Analysis Lab	0	0	2	1	
9.	25EC409PC	Linear and Digital IC Applications Lab	0	0	2	1	
10.	25EC410SD	Web and Mobile Applications	0	0	2	1	
		Total Credits	**15**	**0**	**10**	**20**	

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COURSE CONTENT

MATRICES AND CALCULUS								
B.Tech. I Year I Semester: ECE					**Regulations:** R25			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25MA101BS	**Foundation**	3	1	-	4	40	60	100
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 60**		
Prerequisite: Basic Principles of Algebra and Calculus								

I COURSE OVERVIEW:

This course provides a comprehensive introduction to Matrices & Caluculus, covering fundamental concepts, techniques and applications in Mathematics, Physics, Engineering and other fields.

II COURSE OBJECTIVES:

The students will try to learn:

I	Applying basic operations on matrices and their properties.
II	Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
III	Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
IV	Geometrical approach to the mean value theorems and their application to the mathematical problems
V	Finding maxima and minima of functions of two and three variables.
VI	Evaluation of multiple integrals and their applications.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
CO2:	Find the Eigen values and Eigen vectors and Reduce the quadratic form to canonical form using orthogonal transformations.
CO3:	Apply the mean value theorems and Evaluate the improper integrals using Beta and Gamma functions.
CO4:	Find the extreme values of functions of two variables with/ without constraints.
CO5:	Evaluate the multiple integrals and apply the concept to find areas, volumes

IV COURSE CONTENT:

UNIT- I: (10 Hrs)

Matrices

Rank of a matrix by Echelon form and Normal form — Inverse of Non-singular matrices by Gauss- Jordan method. System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations. Gauss Seidel Iteration Method.

UNIT – II: (10 Hrs)

Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values — Eigen vectors and their properties – Diagonalization of a matrix – Cayley-Hamilton Theorem (without proof) – Fnding inverse and power of a matrix by Cayley-Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms – Reduction of Quadratic form to canonical form by Orthogonal Transformation

UNIT - III: (10 Hrs)

Single Variable Calculus

Limit and Continuous of functions and its properties. Mean value theorems: Rolle's theorem — Lagrange's Mean value theorem with their Geometrical Interpretation and applications — Cauchy's Mean value Theorem — Taylor's Series (All the theorems without proof).

Curve Tracing: Curve tracing in cartesian coordinates.

UNIT - IV: (10 Hrs)

Multivariable Calculus (Partial Differentiation and applications)

Definitions of Limit and continuity — Partial Differentiation: Euler's Theorem — Total derivative — Jacobian – Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT - V: (10 Hrs)

Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates) – change of order of integration (only Cartesian form) — Change of variables for double integrals (Cartesian to polar). Evaluation of Triple Integrals — Change of variables for triple integrals (Cartesian to Spherical and Cylindrical polar coordinates). Applications: Areas by double integrals and volumes by triple integrals.

V TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 45th Edition, 2024-25.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 10th Editon, 2020.

VI REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

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COURSE CONTENT

ADVANCED ENGINEERING PHYSICS								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25PH102BS	**Foundation**	3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Basic Principles of Algebra and Calculus								

I COURSE OVERVIEW:

Engineering Physics is a multidisciplinary course blending physics principles with engineering applications to solve complex technological problems, covering core areas like Quantum Mechanics, Optics, Materials Science, Electromagnetism, and Semiconductors, preparing students for roles in research, innovation, and advanced tech fields like Nanotechnology and Photonics through a mix of theory, lab work, and practical projects.

II COURSE OBJECTIVES:

The students will try to learn:

I. To study crystal structures, defects, and material characterization techniques like XRD and SEM.

II. To understand fundamental concepts of quantum mechanics and their applications in solids and nanomaterials.

III. To introduce quantum computing principles, quantum gates, and basic quantum algorithms.

IV. To learn the properties and applications of magnetic and dielectric materials.

V. To explore the working and applications of lasers and fibre optics in modern technology.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Analyze crystal structures, identify defects, and apply XRD and SEM techniques for material characterization.
CO2:	Apply quantum mechanical principles to explain particle behaviour and energy band formation in solids.
CO3:	Understand quantum computing concepts, use quantum gates, and explain basic quantum algorithms.
CO4:	Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
CO5:	Apply the principles of lasers and fibre optics and their applications in communication and sensing.

IV COURSE CONTENT:

UNIT- I: (12 Hrs)

Crystallography & Materials Characterization

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance; defects in crystals (Qualitative): point defects, line defects, surface defects and volume defects. Concept of nanomaterials: surface to volume ratio, X -ray diffraction: Bragg's law, powder method, calculation of average crystallite size using Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT – II: (12 Hrs)

Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, formation of energy bands, origin of bandgap, classification of solids, concept of discrete energy levels and quantum confinement in nanomaterials.

UNIT - III: (12 Hrs)

Quantum Computing

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates, challenges and advantages of quantum computing over classical computation, quantum algorithms: Deutsch-Jozsa, Shor, Grover.

UNIT - IV: (12 Hrs)

Magnetic and Dielectric Materials

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, synthesis of ferrimagnetic materials using sol-gel method, applications: magnetic hyperthermia for cancer treatment, magnets for EV, Giant Magneto Resistance (GMR) device.

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), load cell and fire sensor.

UNIT - V: (12 Hrs)

Laser and Fibre Optics

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO_2 laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, applications: optical fibre for communication system, sensor for structural health monitoring.

V TEXT BOOKS:

1. Walter Borchardt-Ott, Crystallography: An Introduction, Springer.
2. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons, Inc.
3. Thomas G. Wong, Introduction to Classical and Quantum Computing, Rooted Grove

VI REFERENCE BOOKS:

1. Jozef Gruska, *Quantum Computing*, McGraw Hill
2. Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press.
3. John M. Senior, *Optical Fiber Communications Principles and Practice*, Pearson Education Limited.

VII ELECTRONICS RESOURCES:

- https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fiber-communications-principles-and-pr.pdf
- https://www.geokniga.org/bookfiles/geokniga-crystallography_0.pdf
- https://dpbck.ac.in/wp-content/uploads/2022/10/Introduction-to-Solid-State-PhysicsCharles-Kittel.pdf
- https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf
- https://www.fi.muni.cz/usr/gruska/qbook1.pdf
- https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf
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COURSE CONTENT

PROGRAMMING FOR PROBLEM SOLVING								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	T	P	C	CIE	SEE	Total
25CS105ES	**Engineering Sciences**	3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Basic Mathematics Fundamentals and Computer Knowledge								

I. COURSE OVERVIEW:

This course is Programming for Problem Solving is a foundational, general-purpose language developed in the early 1972s, known for its efficiency, portability, and influence on modern languages like C++, Java, and Python. The course assumes no prior programming experience and focuses on building core skills through hands-on coding, debugging, and problem-solving. By the end, learners can write, compile, and run simple to moderately complex programs

II. COURSE OBJECTIVES:

The students will try to learn:

I To learn the fundamentals of computers.

II To understand the various steps in program development.

III To learn the syntax and semantics of the C programming language.

IV To learn the usage of structured programming approaches in solving problems.

III.COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	To write algorithms, to draw flowcharts for solving problems and to convert the algorithms/flowcharts to C programs.
CO2:	To code and test a given logic in the C programming language.
CO3:	To decompose a problem into functions and to develop modular reusable code.
CO4:	To use arrays, pointers, strings and structures to write C programs.
CO5:	Searching and sorting problems.

IV. COURSE CONTENT:

UNIT- I: (10 Hrs)

Overview of C:C Language Elements, Variable Declarations and Data Types, Creating, Compiling and Executing a program, General Form of a C Program, Operators, Operator Precedence, Formatting Numbers in Program Output, Type Conversions.

Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.

Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

UNIT – II: (9 Hrs)

Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Multidimensional Arrays, Arrays of Pointers.

Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole- Line Input, String Comparison.

UNIT - III: (9 Hrs)

Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.

Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments, Dynamic Memory Allocation.

UNIT - IV: (9 Hrs)

Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters

Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types, Enumerated Types.

UNIT - V: (8)

Text and Binary File Pointers: Input/ Output Files - Review and Further Study, Binary Files.

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

V. TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

VI.REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

VII. ELECTRONICS RESOURCES:

1. https://www.geeksforgeeks.org/c-programming-language/
2. https://www.tutorialspoint.com/cprogramming/
3. https://www.programiz.com/c-programming
4. https://www.w3schools.com/c/c_intro.php

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COURSE CONTENT

INTRODUCTION TO ELECTRICAL ENGINEERING								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**MaximumMarks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EE102ES	**Foundation**	2	0	0	2	40	60	100
ContactClasses:25	**Tutorial Classes:05**	**Practical Classes:Nil**				**TotalClasses:30**		
Prerequisite:BasicPrinciplesofcircuits and machines								

I COURSEOVERVIEW:

This course Introduction to Electrical Engineer is a foundation course of electrical for all engineering branches. The conceptsofDC & AC circuits,Power & Power factor,R-L-C elements,machine, transformer and electrical installations are very useful in real life. This course is applicable for industries.

II COURSEOBJECTIVES:

Thestudentswilltrytolearn:

- **I** To understand DC and Single & Three phase AC circuits
- **II** To study and understand the different types of DC, AC machines and Transformers
- **III** To import the knowledge of various electrical installations and the concept of power, power factor and its improvement

III COURSEOUTCOMES:

At the end of the course students should be able to:	
CO1:	Understand and analyze basic Electrical circuits
CO2:	Understand and analyze basic Electrical circuits Laws and Theorems
CO3:	Study the working principles of Transformers
CO4:	Study the working principles of Electrical Machines and Transformers
CO5:	Introduce components of Low Voltage Electrical Installations

IV COURSECONTENT:

UNIT-I:(6Hrs)

D.C. Circuits: Introduction to R, L and C elements, Independent voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and NortonTheorems. Time-domain analysis of first-order RL and RC circuits.

UNIT–II:(7Hrs)

A.C. Circuits: Introduction to sinusoidal waveforms, phasor representation, the concept of power and power factor, Analysis of 1-phase RLC series and parallel circuits, resonance in series R-L-C circuit. Three-phase balanced circuits, three phase star and delta connections.

UNIT-III:(4Hrs)

Transformers: Principle of operation, Constructional details, Introduction to ideal and practical transformer, losses, regulation and efficiency. Introductionto Auto-transformer.

UNIT-IV:(7Hrs)

Electrical Machines: Principle of operation of DC machine, performance characteristics of dc shunt machine. Principle of operation of a 3-phase induction motor, torque-slip characteristics. Principle of operation of synchronous generator.

UNIT-V:(6)

Electrical Installations: Components of LT Switchgear: SFU, MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, and Characteristics. Elementary calculations for energy consumption, power factor improvement.

V TEXTBOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008

VI REFERENCEBOOKS:

1.P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S.Chand, 2nd Edition, 2019.
2.D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. AbhijitChakrabarthi, SudiptaDebnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

VII ELECTRONICSRESOURCES:

1. http://www.https://www.electrical4u.com/
2. https://nptel.ac.in/courses/117106108
3. https://onlinecourses.nptel.ac.in/noc22_ee90/preview
4. https://ee.iith.ac.in/
5. https://lms.iitjammu.ac.in/course/index.php?categoryid=3

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COURSE CONTENT

ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
CourseCode	**Category**	**Hours/Week**			**Credits**	**MaximumMarks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25ME105ES	**Foundation**	2	0	2	3	40	60	100
Contact Classes:60	**Tutorial Classes:0**	**Practical Classes:60**				**Total Classes:60**		
Prerequisite: Imagination Skills Required								

I COURSE OVERVIEW:

An Engineering drawing and Computer Aided Drafting (ED&CAD) course overview covers the fundamentals of graphic representation of designs, including manual sketching techniques and their transition to using CAD software for creating 2D and 3D models. Key Topics includes Introduction to Engineering Graphics, Orthographic Projections (Projections of points, Straight lines, Planes, Auxiliary planes, Projections of Regular Solids and sectional Views, Development of Surfaces, Isometric Projections of planes, solids, Conversions

II COURSE OBJECTIVES:

This course will enable the students to:

1. To introduce the fundamentals of engineering drawing and projection systems.
2. To develop skills in constructing orthographic, isometric, and sectional views.
3. To train students in interpreting and creating technical drawings using CAD tools.
4. To familiarize students with dimensioning standards and drafting conventions.
5. To bridge manual drafting techniques with computer-aided drafting practices

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Apply the principles of Engineering Drawing to create drawings of various geometric constructions, conic sections, curves and scales as per BIS standards by conventional mode.
CO2:	Construct orthographic projections for points, lines and planes in different quadrants and Auxiliary views of planes both in Conventional and Computer Aided Drafting
CO3:	Draw the sectional views and true shape of sections of solids, by applying principles of projections both in conventional and Computer Aided Drafting
CO4:	Draw the development of surfaces of solids in real time situations by conventional mode.
CO5:	Develop isometric and orthographic views of the objects both in conventional and Computer Aided Drafting.

IV COURSE CONTENT:

UNIT-I:

Introduction to Engineering Graphics (Conventional) (14Hrs)

Principles of Engineering Graphics and their Significance, Geometrical Constructions ,Scales,Plain and Diagonal, Conic Sections including the Rectangular Hyperbola, General method only. Cycloid, Epicycloid and Hypocycloid

UNIT-II:

Orthographic Projections (Conventional and Computer Aided) (12 Hrs)

Principles of Ortho graphic Projections, Conventions, Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands and conics.

UNIT III

Projections of Regular Solids (Conventional and Computer Aided) (14Hrs)

Auxiliary Views, Sections or Sectional views of Right Regular Solids, Prism, Cylinder, Pyramid, Cone, Auxiliary views, Computer aided projections of solids, sectional views

UNIT-IV:

Development of Surfaces (Conventional): **(10Hrs)**

Prism, Cylinder, Pyramid and Cone.

UNIT-V: **Isometric Projections (Conventional and Computer Aided) (10Hrs)**

Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Isometric Views of Lines, Plane Figures, Simple and Compound Solids, Isometric Projection of objects having non, isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. Conversion of orthographic projection into isometric view.

V TEXT BOOKS:

1. Engineering Drawing, N.D.Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rdEdition, 2010.

VI REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C.M.Agrawal, Mc Graw Hill, 3rdEdition, 2019.
2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rd Edition, 2020.
3. Engineering Drawing, M.B.Shah and B.C.Rane, Pearson, 2ndEdition, 2009.
4. Engineering Drawing, N.S.Parthasarathy and Vela Murali, Oxford,1st Edition,2015.
5. Computer Aided Engineering Drawing, K.Balaveera Reddy, CBS Publishers, 2ndEdition, 2015.

VII ELECTRONIC RESOURCES:

1. https://soaneemrana.com/onewebmedia/ENGINEERING%20DRAWING%20BY%20N.D%20BHATT.pdf

2. https://ia800105.us.archive.org/0/items/TextbookOfEngineeringDrawing_201802/Textbook%20of%20Engineering%20Drawing.pdf

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

ENGLISH FOR SKILL ENHANCEMENT								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EN103HS	**Foundation**	3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Basic understanding of vocabulary, grammar, reading, and writing skills in English								

I COURSE OVERVIEW:

English for Skill Enhancement focuses on skill development, fostering ideas and practice of language skills in various contexts and cultures in the areas of vocabulary, grammar, reading and writing.

II COURSE OBJECTIVES:

This course will enable the students to:

I. Improve their vocabulary.
II. Use appropriate sentence structures in their oral and written communication.
III. Develop their reading and study skills.
IV. Equip students to write paragraphs, essays, précis and draft letters.
V. Acquire skills for Technical report writing

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Choose appropriate vocabulary in their oral and written communication.
CO2:	Demonstrate their understanding of the rules of functional grammar and sentence structures.
CO3:	Develop comprehension skills from known and unknown passages.
CO4:	Write paragraphs, essays, précis and draft letters.
CO5:	Write abstracts and reports in various contexts.

IV COURSE CONTENT:

UNIT- I: (12 Hrs)

Theme:	Perspectives
	Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.
Vocabulary:	The Concept of Word Formation-The Use of Prefixes and Suffixes-Words Often Misspelt - Synonyms and Antonyms
Grammar:	Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions – Degrees of Comparison
Reading:	Reading and Its Importance-Sub Skills of Reading–Skimming and Scanning.
Writing:	Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation-Techniques for Writing Precisely–Nature and Style of Formal Writing.

UNIT – II: (12 Hrs)

Theme:	Digital Transformation
	Lesson on '*Emerging Technologies*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.
Vocabulary:	Homophones, Homonyms and Homographs
Grammar:	Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading:	Reading Strategies-Guessing Meaning from Context–Identifying Main Ideas–Exercises for Practice
Writing:	Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

UNIT - III: (12 Hrs)

Theme:	Attitude and Gratitude
	Poems on '*Leisure'* by William Henry Davies and '*Be Thankful'* -Unknown Author from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.
Vocabulary:	Words Often Confused-Words from Foreign Languages and their Use in English.
Grammar:	Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading:	Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas – Exercises for Practice
Writing:	Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume–Difference between Writing a Letter and an Email - Email Etiquette

UNIT - IV: (12 Hrs)

Theme:	Entrepreneurship
	Lesson on '*Why a Start-Up Needs to Find its Customers First*' by Pranav Jain from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.
Vocabulary:	Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.
Grammar:	Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.
Reading:	Prompt Engineering Techniques–Comprehending and Generating Appropriate Prompts - Exercises for Practice
Writing:	Writing Practices-Note Making – Précis Writing.

UNIT - V: (12 Hrs)

Theme:	Integrity and Professionalism **Lesson on '*Professional Ethics*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.**
Vocabulary:	Technical Vocabulary and their Usage–One Word Substitutes–Collocations.
Grammar:	Direct and Indirect Speech-Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)
Reading:	Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice
Writing:	Report Writing- Technical Reports-Introduction–Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format)-Types of Reports-Writing a Technical Report.

Note: *Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

- (**Note**: As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech. First Year is* Open-ended, besides following the prescribed textbook; it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.)

V TEXT BOOKS:

1. Board of Editors.*2025.English for the Young in the Digital World.* Orient Black Swan Pvt. Ltd.

VI REFERENCE BOOKS:

1. Swan,Michael.(2016).*PracticalEnglishUsage.*OxfordUniversityPress.NewEdition.
2. *Karal,Rajeevan.2023.EnglishGrammarJustforYou.*OxfordUniversityPress.NewDelhi
3. 2024.*Empowering with Language: Communicative English for Undergraduates.* Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. *Communication Skills – A Workbook.* Oxford University Press. New Delhi
5. Wood ,F.T.(2007).*Remedial English Grammar.* Macmillan.
6. Vishwamohan, Aysha.(2013).*EnglishforTechnicalCommunicationforEngineeringStudents.* McGraw-Hill Education India Pvt. Ltd.

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COURSE CONTENT

ADVANCED ENGINEERING PHYSICS LAB								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25PH106BS	**Foundation**	-	-	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: Nill**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Basic lab handling skills in introductory courses								

I. COURSE OVERVIEW:

An Engineering Physics Lab course provides hands-on experience to bridge theory and practice, focusing on experiments in optics, electronics, mechanics, and modern physics (lasers, fibers) to develop practical skills, precise measurement techniques, data analysis, and technical report writing, enabling students to apply physics principles to real-world engineering problems and design solutions..

II. COURSE OBJECTIVES:

The students will try to learn:

1. To provide practical exposure to advanced concepts in solid-state and modern physics.
2. To synthesize and study the physical properties of materials like semiconductors, ferromagnetic, and ferroelectric substances.
3. To perform semiconductor characterization using Hall effect and band gap experiments.
4. To explore the working principles of lasers and optical fibers through hands-on experiments.
5. To develop skills in data analysis, interpretation, and scientific reporting.

III. COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Synthesize and analyze nanomaterials such as magnetite (Fe_3O_4) using chemical methods.
CO2:	Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials
CO3:	Characterize semiconductors using Hall effect and energy gap measurement techniques
CO4:	Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study
CO5:	Apply scientific methods for accurate data collection, analysis, and technical report writing

IV COURSE CONTENT:

List of Experiments:

1. Synthesis of magnetite (Fe_3O_4) powder using sol-gel method.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concertation of a given semiconductor.
4. Determination of magnetic field along the axis of a current carrying coil.
5. Study of B-H curve of a ferro magnetic material.
6. Determination of work function and Planck's constant using photoelectric effect.
7. Determination of dielectric constant of a given material.
8. Determination of Curie's temperature of a given ferroelectric material.
9. Determination of wavelength of a laser using diffraction grating.
10. Study of V-I & L-I characteristics of a given laser diode.
11. Determination of numerical aperture of a given optical fibre.
    Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.

V REFERENCE BOOKS:

1. Practical physics by Vijay Kumar and T Radha Krishna (JNTUH).

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COURSE CONTENT

PROGRAMMING FOR PROBLEM SOLVING LAB								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
25CS107ES	**Engineering Sciences**	L	T	P	C	CIE	SEE	Total
		0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Basic Mathematics Fundamentals and Computer Knowledge								

I COURSE OVERVIEW:

Programming for Problem Solving Lab is intended to provide hands-on exposure to problem solving using the C programming language. This course enables students to understand the program development process and to work effectively with an Integrated Development Environment (IDE) for writing, compiling, debugging, and executing programs.

II COURSE OBJECTIVES:

The students will try to learn:

I To work with an IDE to create, edit, compile, run and debug programs

II To analyze the various steps in program development.

III To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.

IV To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.

V To Write programs using the Dynamic Memory Allocation concept.

VI To create, read from and write to text and binary files

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Formulate algorithms for simple problem-solving tasks and Translate algorithms into correct and executable C programs.
CO2:	Identify and correct syntax and logical errors in programs.
CO3:	Use arrays, strings, structures, and pointers to represent and manipulate data.
CO4:	Apply modular programming concepts using functions, dynamic memory allocation, and file handling.
CO5:	Develop efficient solutions using sorting, searching, and standard problem-solving techniques.

IV COURSE CONTENT:

PRACTICE SESSIONS:

Simple numeric problems:

a) Write a program for finding the max and min from the three numbers.
b) Write the program for the simple, compound interest.
c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 = 10
   5 x 3 = 15
d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
b) Write a program that finds if a given number is a prime number.
c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a C program that uses functions to perform the following:
   I. Addition of Two Matrices
   II. Multiplication of Two Matrices
c) Write a program for reading elements using a pointer into an array and display the values using the array.
d) Write a program for display values reverse order from an array using a pointer.

Files:

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) Write a C program that uses functions to perform the following operations:
   I. To insert a sub-string into a given main string from a given position.
   II. To delete n Characters from a given position in a given string
b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.
b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.
c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
d) Write a C program that sorts the given array of integers using selection sort in descending order
e) Write a C program that sorts the given array of integers using insertion sort in ascending order
f) Write a C program that sorts a given array of names.

V TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

VI REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

VII ELECTRONICS RESOURCES:

1. https://www.geeksforgeeks.org/c-programming-language/
2. https://www.tutorialspoint.com/cprogramming/
3. https://www.programiz.com/c-programming
4. https://www.w3schools.com/c/c_intro.php

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COURSE CONTENT

ENGLISH LANGUAGE AND COMMUNICATION SKILLS (ELCS) LAB								
B.Tech. I Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EN108HS	**Foundation**	-	-	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Basic listening and speaking skills in English								

I COURSE OVERVIEW:

The **English Language and Communication Skills (ELCS) Lab** focuses on listening and speaking skills, particularly on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

II COURSE OBJECTIVES:

To enable students develop their active listening skills:

VII To enable students develop their active listening skills

VIII To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds

IX To improve their pronunciation and neutralize accent

X To enable students express themselves fluently and appropriately

XI To practice speaking in social and professional contexts

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Listen actively and identify important information in spoken texts
CO2:	Interpret the speech and infer the intention of the speaker
CO3:	Improve their accent for intelligibility
CO4:	Speak fluently with clarity and confidence
CO5:	Use the language in real life situations

IV COURSE CONTENT:

The English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab, which focuses on listening skills

b. Interactive Communication Skills (ICS) Lab, which focuses on speaking skills

The following course content is prescribed for the English Language and Communication Skills Lab.

Exercise– I
CALL Lab:
Instruction: Speech Sounds-Listening Skill-Importance–Purpose-Types-Barriers-Active Listening
Practice: Listening to Distinguish Speech Sounds (Minimal Pairs)-Testing Exercises
ICS Lab:
❖ **Diagnostic Test – Activity titled '*Express Your View*'**
Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others
Practice: Any Ice-Breaking Activity

Exercise–II
CALL Lab:
Instruction: Listening vs. Hearing- Barriers to Listening
Practice: Listening for General Information - Multiple Choice Questions - Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: Features of Good Conversation–Strategies for Effective Communication
Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations –Making Requests and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise-III
CALL Lab:
Instruction: Errors in Pronunciation–Tips for Neutralizing Mother Tongue Influence (MTI)
Practice: Differences between British and American Pronunciation –Listening Comprehension Exercises
ICS Lab:
Instruction: Describing Objects, Situations, Places, People and Events
Practice: Picture Description Activity–Looking at a Picture and Describing Objects, Situations, Places, People and Events (A wide range of Materials / Handouts are to be made available in the lab.)

Exercise–IV CALL Lab:
Instruction: Techniques for Effective Listening
Practice: Listening for Specific Details-Listening-Gap Fill Exercises-Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: How to Tell a Good Story-Story Star-Sequencing-Creativity
Practice: Activity on Telling and Retelling Stories-Collage

Exercise–V
CALL Lab:
Instruction: Identifying the literal and implied meaning
Practice: Listening for Evaluation-Write the Summary–Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: Understanding Non-Verbal Communication
Practice: Silent Speech- Dumb Charades Activity
❖ **Post-Assessment Test on 'Express Your View'**

Minimum Requirement of Infrastructural Facilities for ELCS Lab

1. Computer Assisted Language Learning (CALL) Lab

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one master console, LAN facility, and English language learning software for self-study by students.

System Requirements (Hardware Components):

- Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:
  i) Computers with suitable configuration
  ii) High-fidelity headphones

2. Interactive Communication Skills (ICS) Lab

The Interactive Communication Skills Lab should be a spacious room with movable chairs and audio-visual aids, a public address system, a TV or LCD, a digital stereo audio and video system, and a camcorder.

Note: English language teachers are requested to prepare materials and handouts for each activity for the use of those materials in CALL and ICS Labs.

Suggested Software

- Cambridge Advanced Learner's English Dictionary with CD
- Grammar Made Easy by Dorling Kindersley
- Punctuation Made Easy by Dorling Kindersley
- Oxford Advanced Learner's Compass, 10th Edition
- English in Mind (Series 1–4) by Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

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COURSE CONTENT

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25MA201BS	**Foundation**	3	-	-	3	40	60	100
Contact Classes: 60	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 60**		
Prerequisite: Basic understanding of level Mathematics concepts								

I COURSE OVERVIEW:

This course provides a comprehensive foundation in **Differential Equations and Vector Calculus**, bridging the gap between theoretical calculus and practical engineering applications. It moves from solving first-order and higher-order ODEs to mastering **Laplace Transforms**, a vital tool for analyzing linear systems and initial value problems. Finally, it explores **Vector Field Theory**, culminating in the major integration theorems (Green, Gauss, and Stokes) used to solve complex physical problems involving flux and circulation.

II COURSE OBJECTIVES:

The students will try to learn:

I. Methods of solving the differential equations of first and higher order.
II. Concept, properties of Laplace transforms
III. Solving ordinary differential equations using Laplace transforms techniques.
IV. The physical quantities involved in engineering field related to vector valued functions.
V. The basic properties of vector valued functions and their applications to line, surface and volume integrals

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Identify whether the given differential equation of first order is exact or not
CO2:	Apply the concept of differential equation to real world problems.
CO3:	Use the Laplace transforms techniques for solving ODE's
CO4:	Use gradient to evaluate directional derivatives and conservative vector field.
CO5:	Calculate the line, surface and volume integrals and converting them from one to another.

IV COURSE CONTENT:

UNIT- I: (12 Hrs)

First Order ODE

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT – II: (12 Hrs)

Ordinary Differential Equations of Higher Order

Higher order linear differential equations with constant coefficients: Non-Homogeneousterms of the type e^{ax}, $Sin ax$, $Cos ax$, polynomials in x, $e^{ax} V(x)$ and $x V(x)$, Method of variation of parameters.

UNIT - III: (12 Hrs)

Laplace transforms:

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Secondshifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integralsof function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method

UNIT - IV: (12 Hrs)

Vector Differentiation

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT - V: (12 Hrs)

Vector Integration

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

V TEXT BOOKS:

3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 45th Edition, 2024-25.
4. 2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, NarosaPublications,10th Edition, 2020.

VI REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2018.
2. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand andCompany Limited, New Delhi.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications .Reprint. 2018..

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COURSE CONTENT

ENGINEERING CHEMISTRY								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25CH202BS	**Foundation**	3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Basic understanding of level chemistry concepts								

I COURSE OVERVIEW:

The Engineering Chemistry course provides the foundational chemical principles and applications essential for all branches of engineering. It bridges the gap between pure chemistry and engineering practices by explaining how chemical processes, materials, and technologies influence modern engineering systems.

II COURSE OBJECTIVES:

The students will try to learn:

1. To develop adaptability to new advances in Engineering Chemistry and acquire the essential skills to become a competent engineering professional.
2. To understand the industrial significance of water treatment, fundamental principles of battery chemistry, and the impact of corrosion along with its control methods for structural protection.
3. To impart foundational knowledge of various energy sources and their practical applications in engineering.
4. To equip students with an understanding of smart materials, biosensors, and analytical techniques applicable in engineering, industrial, environmental, and biomedical fields.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Basic properties of water and its treatment methods for both domestic and industrial use.
CO2:	Basic understanding of electrochemical processes, including corrosion and its control mechanisms.
CO3:	Comprehend principles and applications of various energy sources, such as batteries and fuels, relevant to engineering.
CO4:	Basic concepts and properties and applications of different types of polymers and engineering materials.
CO5:	Apply the principles of spectroscopic techniques (UV-Vis, IR, Raman) for material analysis and pollution detection.

IV COURSE CONTENT:

UNIT- I: (12 Hrs)

Water and its treatment (14 Hrs)

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods - Softening of water by ion- exchange processes. Desalination of brackish water – Reverse

UNIT – II: (12 Hrs)

Electrochemistry and Corrosin (12 Hrs)

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electro-chemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode – Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

Corrosion:

Introduction- Definition, causes and effects of corrosion – Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

UNIT - III: (12 Hrs)

Energy sources:

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium ion battery. Fuel Cells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value – Units - HCV, LCV- Dulongs **formula – Numerical problems.**

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking

Synthetic Fuels – Moving bed catalytic cracking. LPG and CNG composition and uses.

: Fischer-Tropsch process, Introduction and applications of Hythane and Green Hydrogen.

UNIT - IV: (12 Hrs)

Polymers

Definition - Classification of polymers: Based on origin and tacticity with examples –Types of polymerization-Addition (free radical addition mechanism) and condensation polymerization. **Plastics, Elastomers and Fibers:** Definition and applications (PVC, Buna-S, Nylon-6,6). Differences between thermoplastics and thermo setting plastics, Fiber reinforced plastics (FRP).

Conducting polymers: Definition and Classification with examples - Mechanism of conduction in trans-poly-acetylene and applications of conducting polymers.

Biodegradable polymers: Polylactic acid and its applications.

UNIT - V: (12 Hrs)

Advanced Functional Materials:

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol,- Piezo-electric materials – quartz and their engineering applications.

Biosensor - Definition, Amperometric Glucose monitor sensor. Interpretative spectroscopic applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumour detection in Medical applications.

V TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.

VI REFERENCE BOOKS:

1. Engineering Chemistry: by Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen by Editors: Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine, https://www.worldscientific.com/doi/epdf/10.1142/13094

VII ELECTRONICS RESOURCES:

E-Content- https://doi.org/10.1142/13094 | October 2023

E-books: https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

PYTHON PROGRAMMING								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
25CS203ES	**Foundation**	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Basic knowledge of computer fundamentals, C programming								

I COURSE OVERVIEW:

The Python Programming course introduces students to the fundamentals of programming using Python, focusing on problem-solving skills. Students will learn how to design algorithms, implement logic using Python, and develop modular, reusable, and efficient code.

The course covers Python's core features, including data types, control structures, functions, modules, and built-in data structures such as lists, tuples, sets, and dictionaries. Students also gain knowledge of file handling, exception handling, and object-oriented programming (OOP) concepts.

By the end of the course, students will be able to develop small-scale applications for automation, data processing, and analysis using Python, preparing them for advanced topics in software development, data science, and AI/ML.

II COURSE OBJECTIVES:

The students will try to learn:

I Introduce the fundamentals of Python programming for problem-solving.
II Develop skills to write structured, modular, and efficient Python code.
III Enable students to use Python's built-in data structures and libraries effectively.
IV Provide knowledge on file handling, exception handling, and object-oriented programming in Python.
V Equip students with the ability to apply Python for real-world applications including data processing

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Write Python programs using variables, operators, expressions, and control structures.
CO2:	Implement Python programs using built-in data structures like lists, tuples, sets, and dictionaries.
CO3:	Apply modular and object-oriented programming principles in Python.
CO4:	Handle files, exceptions, and apply Python libraries for problem-solving.
CO5:	Develop small-scale applications in Python for automation and data manipulation.

IV COURSE CONTENT:

UNIT- I:

Introduction to Python and Basics of Programming:
Introduction to Python: Features, Applications, Installation, IDEs, Python Syntax, Indentation, Comments, Variables, Data Types, Type Casting, Operators: Arithmetic, Relational, Logical, Assignment, Membership, Identity, Bitwise, Input/Output functions (input(), print()), Control Structures: if, if-else, if-elif-else, Nested Conditions, Looping: for, while, Nested Loops, break, continue, pass.

UNIT – II:

Data Structures in Python:
Strings: Creation, Indexing, Slicing, Methods, String Formatting, Lists: Creation, Indexing, Slicing, List Comprehension, Methods, Tuples: Properties, Indexing, Methods, Sets: Creation, Operations, Methods, Dictionaries: Creation, Access, Methods, Dictionary Comprehension, Iterating over data structures.

UNIT - III:

Functions and Modules:
Functions: Defining, Calling, Parameters, Return Values, Types of Arguments: Positional, Keyword, Default, Variable Length, Scope of Variables: Local and Global, Lambda Functions, Map, Filter, Reduce, Recursion in Python, Modules: Importing, Creating User-defined Modules, Standard Modules(math,random,datetime),Packages in Python.

UNIT - IV:

File Handling and Exception Handling:
File Handling: Opening, Reading, Writing, Appending, File Modes, File Methods, Working with CSV and JSON Files, Exception Handling: try, except, else, finally, Built-in Exceptions, Raising Exceptions, Introduction to Regular Expressions (re module).

UNIT - V

Object-Oriented Programming and Applications:
OOP Basics: Classes, Objects, Attributes, Methods, Constructor (__init__), self keyword, Inheritance: Single, Multiple, Multilevel, Hierarchical, Method Overriding, Method Overloading (conceptual), Encapsulation and Polymorphism, Application Development: Data Processing Script, Basic Calculator, File Organizer, Simple Data Analysis with pandas.

V TEXT BOOKS:

1. Python Programming: Using Problem Solving Approach by Reema Thareja.
2. Python Crash Course by Eric Matthes, Learning Python by Mark Lutz

VI REFERENCE BOOKS:

1. Introduction to Python Programming by Gowrishankar S., Veena A.
2. Python Cookbook by David Beazley and Brian K. Jones.
3. Fluent Python by Luciano Ramalho, Automate the Boring Stuff with Python by Al Sweigart.

VII ELECTRONICS RESOURCES:

1. NPTEL Online Courses – *Python Programming*: https://nptel.ac.in/courses/106/105/106105207/
2. Python Official Documentation – Comprehensive reference for Python language and standard libraries: https://docs.python.org/3/
3. TutorialsPoint – Python Programming – Beginner-friendly tutorials with examples: https://www.tutorialspoint.com/python/index.htm
4. GeeksforGeeks – Python Programming – Covers basics to advanced topics with code snippets: https://www.geeksforgeeks.org/python-programming-language/
5. W3Schools – Python Tutorial – Interactive Python tutorials with exercises: https://www.w3schools.com/python/
6. Real Python – Articles, tutorials, and projects for applied Python programming: https://realpython.com/
7. Kaggle – Platform for Python-based data analysis and mini-projects: https://www.kaggle.com/
8. PyPI (Python Package Index) – Repository of Python libraries for practical applications: https://pypi.org/

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

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COURSE CONTENT

DATA STRUCTURES								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
25CS205ES	**Engineering and Sciences**	L	T	P	C	CIE	SEE	Total
		3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: A course on Programming for Problem Solving								

I COURSE OVERVIEW:

This course provides a comprehensive introduction to data structures and algorithms used in computer programming. It emphasizes the selection of appropriate data structures, analysis of their efficiency, and implementation of algorithms for searching, sorting, hashing, and file organization.

II COURSE OBJECTIVES:

The students will try to learn:

I. Exploring basic data structures such as stacks and queues.
II. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
III. Introduces sorting and pattern matching algorithms.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Understand and apply fundamental concepts of data structures and abstract data types to implement linear data structures such as linked lists, stacks, and queues.
CO2:	Analyze and implement hashing techniques using appropriate hash functions and collision resolution methods for efficient data storage and retrieval.
CO3:	Design and implement tree-based data structures including binary trees, heaps, and binary search trees, and perform traversal, insertion, deletion, and searching operations.
CO4:	Evaluate advanced tree structures such as AVL trees, Red-Black trees, Splay trees, threaded binary trees, and B-trees to achieve balanced and efficient searching.
CO5:	Apply graph representations, traversal algorithms, and sorting techniques to solve problems related to networks, relationships, and data organization.

IV COURSE CONTENT:

UNIT- I:

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list – Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues-operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT – II:

Hashing and Collision Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method, collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining.

UNIT - III:

Trees Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Heaps, Comparison of various Heaps, Applications Searching, Binary Search Trees (BST), BST Operations Searching, Insertion and Deletion, BST ADT, BST Applications

UNIT - IV:

Threaded Binary Trees, AVL Trees, Red Black Trees, Splay Trees Multi way Search Trees, Introduction, B Trees

UNIT – V

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs. Graph Traversal Algorithms, Graph ADT, Applications of Graphs, **Sorting:** Radix Sort, Heap sort, Shell Sort

V TEXT BOOKS:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning
2. Data Structure using C– Reema Thareja, 3rd Edition, Oxford University Press.

VI REFERENCE BOOKS:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

VELECTRONICS RESOURCES:

1. NPTEL – Data Structures and Algorithms (Video Lectures & Course)
   https://nptel.ac.in/courses/106/102/064/
2. GeeksforGeeks – Data Structures & Algorithms Tutorials and Practice
   https://www.geeksforgeeks.org/data-structures-and-algorithms-online-courses-free-and-paid/
3. Coursera – Data Structures Course (University of California San Diego)
   https://www.coursera.org/learn/data-structures
4. W3Schools (Data Structures Tutorial Index)
   https://www.w3schools.in/data-structures/tutorials/
5. Google Tech Dev Guide – Data Structures Resources & Practice
   https://techdevguide.withgoogle.com/resources/topics/data-structures/
6. GitHub – DSA Resources (Community Compiled Lists)
   https://github.com/GDSC-KIIT/DSA-Resources

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COURSE CONTENT

NETWORK ANALYSIS AND SYNTHESIS								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EE201ES	**Foundation**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

I. To understand the basic concepts on RLC circuits.
II.. To know the behavior of the steady state and transient states in RLC circuits.
III. To understand the two port network parameters.
IV. Learn the design concepts of various filters and attenuators

II COURSE OUTCOMES:

At the end of the course, students should be able to:	
CO1:	Gain the knowledge on basic RLC circuits behaviour. .
CO2:	Analyse the Steady state and transient analysis of RLC Circuits
CO3:	Characterization of two port network parameters.
CO4:	Analyse the Design aspect of various filters and attenuators

III COURSE CONTENT:

UNIT- I: (5 Hrs)

Network Topology: Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT – II: (7 Hrs)

Transient and Steady state analysis: RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2nd order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves**.**

UNIT - III: (6 Hrs)

Two port network parameters: Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T, □ □, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT - IV: (7 Hrs)

Filters: Classification of Filters, Filter Networks, Constant-K Filters-Low pass, high pass, Band pass, band-stop filters, M-derived Filters- T and π filters- Low pass, high pass Attenuators: Types – T, π , L, Bridge T and lattice ,Asymmetrical Attenuators T, π , L Equalizers- Types- Series, Shunt, Constant resistance, bridge T attenuation, bridge T phase, Lattice attenuation, lattice Phase equalizers

UNIT - V: (5 Hrs)

Network Synthesis: Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non-ladder networks, Poles, Zeros analysis of network functions, Hurwitz polynomials, Positive Real Functions, synthesis of LC, RC and RL Functions by foster and causer methods.

IV.TEXT BOOKS:

1.Van Valkenburg -Network Analysis, 3rd Ed., Pearson, 216.
2. JD Ryder - Networks, Lines and Fields, 2nd Ed., PHI, 1999

V.REFERENCE BOOKS:

1.J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education, 1999.
2. A. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw- Hill Publications 3. 3.
3.William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., William Hayt and Jack E. Kimmerley, McGraw Hill Company

VI. ELECTRONICS RESOURCES:

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://onlinecourses.nptel.ac.in/noc25_ee91/

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COURSE CONTENT

ENGINEERING CHEMISTRY LAB								
B.Tech. I Year II Semester: ECE					**Regulations:** R25			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25CH206BS	**Foundation**	-	-	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Basic lab handling skills in introductory chemistry courses								

I COURSE OVERVIEW:

Engineering Chemistry Lab is designed to give students hands-on experimental experience to reinforce and complement the theoretical concepts learned in this course. It helps bridge the gap between theory and practice, by enabling students to perform chemical analyses relevant to engineering applications.

II COURSE OBJECTIVES:

The students will try to learn:

1. Students will understand and perform experiments based on core chemical principles relevant to engineering applications.
2. Students will learn to estimate the hardness of water to assess its suitability for drinking purposes.
3. Students will acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metry.
4. Students will gain hands-on experience in synthesizing polymers like Bakelite and Nylon 6, 6 in the laboratory.
5. Students will learn to determine the unknown concentration of potassium permanganate ($KMnO_4$) using a calibration curve.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Perform volumetric and instrumental analysis to estimate the concentration of chemical species in solutions.
CO2:	To determine important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
CO3:	Applying techniques like conductometry, potentiometry, and pH metry to determine concentrations or equivalence points in acid-base reactions.
CO4:	To synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
CO5:	To understand the working principle of colorimetry and the relationship between absorbance and concentration (Beer-Lambert Law).

IV COURSE CONTENT:

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry:

1. Estimation of the concentration of strong acid by Conductometry.
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

II. Potentiometry:

1. Estimation of concentration of Fe^{+2}ion by Potentiometry using $KMnO_4$.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

III. pH Metry: Determination of an acid concentration using pH meter.

IV. Colorimetry: Verification of Lambert-Beer's law using $KMnO_4$.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon – 6, 6.

VI. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VII. Virtual lab experiments:

1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

V REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022).
2. Vogel's text book of practical organic chemistry 5th edition.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

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COURSE CONTENT

APPLIED PYTHON PROGRAMMING LAB								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	T	P	C	CIE	SEE	Total
25EC207ES	**Engineering and Science**	-	-	2	1	40	60	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Basic Mathematics Fundamentals and Computer Knowledge								

I COURSE OVERVIEW:

The Applied Python Programming Lab is designed to provide hands-on experience in programming and practical problem-solving using Python. Students will learn to implement Python programs for a variety of applications, ranging from basic computations and data processing to working with external packages like NumPy, SciPy, and matplotlib.

II COURSE OBJECTIVES:

The students will try to learn:

VII Provide hands-on experience in writing and executing **Python programs** for various computational and data-processing tasks.

VIII Enable students to use **Python libraries and packages** such as NumPy, SciPy, matplotlib, and others for practical problem-solving.

IX Introduce **file handling, string processing, and basic data visualization** in Python.

X Familiarize students with **hardware interfacing using Raspberry Pi**, including GPIO pin control and sensor data collection.

XI Develop skills to design and implement **small-scale real-world applications**, combining software programming and hardware integration.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	**Develop Python programs** using fundamental constructs such as variables, operators, control statements, loops, and functions.
CO2:	**Apply Python libraries** (NumPy, SciPy, matplotlib, and strings) to perform data processing, analysis, and visualization tasks.
CO3:	**Handle files and text data** effectively, including reading, writing, and performing operations on textual datasets.
CO4:	**Implement Python programs on hardware platforms** such as Raspberry Pi for GPIO control, LED interfacing, and sensor data acquisition.
CO5:	**Design small-scale real-world applications** integrating Python programming and hardware components for automation and data-driven tasks.

IV COURSE CONTENT:

PRACTICE SESSIONS:

LIST OF EXPERIMENTS:

Cycle - 1

1. Downloading and Installing Python and Modules

a) Python 3 on Linux

Follow the instructions given in the URL https://docs.pythonguide.org/starting/install3/linux/

b) Python 3 on Windows

Follow the instructions given in the URL https://docs.python.org/3/using/windows.html

(Please remember that Windows installation of Python is harder!)

c) pip3 on Windows and Linux

Install the Python package installer by following the instructions given in the URL https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/

d) Installing numpy and scipy

You can install any python3 package using the command pip3 install <packagename>

e) Installing jupyterlab

Install from pip using the command pip install jupyterlab

2. Introduction to Python3

a) Printing your biodata on the screen

b) Printing all the primes less than a given number

c) Finding all the factors of a number and show whether it is a perfect number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself

3. Defining and Using Functions

a) Write a function to read data from a file and display it on the screen

b) Define a boolean function is palindrome(<input>)

c) Write a function collatz(x) which does the following: if x is odd, x = 3x + 1; if x is even, then x = x/2. Return the number of steps it takes for x = 1

d) Write a function N(m, s) = exp(-(x-m)2

/(2s2

))/sqrt(2π)s that computes the Normal

distribution

4. The package numpy

a) Creating a matrix of given order m x n containing random numbers in the range 1 to 99999

b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed

c) Write a program to solve a system of n linear equations in n variables using matrix inverse

5. The package scipy and pyplot

a) Finding if two sets of data have the same mean value

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

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b) Plotting data read from a file

c) Fitting a function through a set a data points using polyfit function

d) Plotting a histogram of a given data set

6. The strings package

a) Read text from a file and print the number of lines, words and characters

b) Read text from a file and return a list of all n letter words beginning with a vowel

c) Finding a secret message hidden in a paragraph of text

d) Plot a histogram of words according to their length from text read from a file

Cycle -2

7. Installing OS on Raspberry Pi

a) Installation using PiImager

b) Installation using image file

- Downloading an Image
- Writing the image to an SD card
- using Linux

 using Windows
 Booting up

Follow the instructions given in the URL
https://www.raspberrypi.com/documentation/computers/getting-started.html

8. Accessing GPIO pins using Python

a) Installing GPIO Zero library.

First, update your repositories list:
sudo apt update
Then install the package for Python 3:
sudo apt install python3-gpiozero

b) Blinking an LED connected to one of the GPIO pin

c) Adjusting the brightness of an LED

d) Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.

9. Collecting Sensor Data

a) DHT Sensor interface

◦ Connect the terminals of DHT GPIO pins of Raspberry Pi.
◦ Import the DHT library using import Adafruit_DHT
◦ Read sensor data and display it on screen.

V TEXT BOOKS:

1. Python Programming: Using Problem Solving Approach by Reema Thareja.
2. Python Crash Course by Eric Matthes, Learning Python by Mark Lutz

VI REFERENCE BOOKS:

1. Introduction to Python Programming by Gowrishankar S., Veena A.
2. Python Cookbook by David Beazley and Brian K. Jones.
3. Fluent Python by Luciano Ramalho, Automate the Boring Stuff with Python by Al Sweigart.

VII ELECTRONICS RESOURCES:

1. NPTEL Online Courses – *Python Programming*: https://nptel.ac.in/courses/106/105/106105207/
2. Python Official Documentation – Comprehensive reference for Python language and standard libraries: https://docs.python.org/3/
3. TutorialsPoint – Python Programming – Beginner-friendly tutorials with examples: https://www.tutorialspoint.com/python/index.htm
4. GeeksforGeeks – Python Programming – Covers basics to advanced topics with code snippets: https://www.geeksforgeeks.org/python-programming-language/
5. W3Schools – Python Tutorial – Interactive Python tutorials with exercises: https://www.w3schools.com/python/
6. Real Python – Articles, tutorials, and projects for applied Python programming: https://realpython.com/
7. Kaggle – Platform for Python-based data analysis and mini-projects: https://www.kaggle.com/
8. PyPI (Python Package Index) – Repository of Python libraries for practical applications: https://pypi.org/

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

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COURSE CONTENT

DATA STRUCTURES LAB								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	T	P	C	CIE	SEE	Total
25CS207ES	**Engineering and Science**	-	-	2	1	40	60	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: A course on Programming for Problem Solving								

I COURSE OVERVIEW:

The **Data Structures Lab** provides hands-on experience in implementing fundamental and advanced data structures using the C programming language. It reinforces theoretical concepts learned in the *Data Structures* theory course by enabling students to:

- Develop programs using arrays, pointers, functions, and control structures.
- Implement linear and non-linear data structures such as stacks, queues, linked lists, trees, heaps, graphs, and hash tables.
- Apply sorting and searching algorithms efficiently to solve real-world computational problems.
- Gain practical skills in modular program design, debugging, and algorithm optimization.

This lab is designed to strengthen logical thinking, programming proficiency, and problem-solving skills, bridging the gap between theory and practical applications of data structures in computer science.

II COURSE OBJECTIVES:

The students will try to learn:

I It covers various concepts of C programming language

II It introduces searching and sorting algorithms

III It provides an understanding of data structures such as stacks and queues.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Develop C programs using arrays, functions, pointers, and control statements for solving computational problems.
CO2:	Implement and manipulate linear data structures such as stacks, queues, and linked lists efficiently.
CO3:	Construct and traverse non-linear data structures including binary trees, AVL trees, B-trees, and graphs.
CO4:	Apply sorting and searching algorithms such as radix sort, heap sort, shell sort, interpolation search, and binary search in practical scenarios.
CO5:	Implement and analyze hash functions and collision resolution techniques to store and retrieve data effectively.

IV COURSE CONTENT:

PRACTICE SESSIONS:

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) ADT
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) ADT
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Radix Sort, ii) Heap sort, iii) Shell Sort
7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) AVL trees iii) Red - Black trees
9. Write a program to implement the graph traversal methods.
10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method.

V. TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

VI. REFERENCE BOOKS:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

VII. ELECTRONICS RESOURCES:

1. NPTEL – Data Structures and Algorithms (Video Lectures & Course)
   https://nptel.ac.in/courses/106/102/064/
2. GeeksforGeeks – Data Structures & Algorithms Tutorials and Practice
   https://www.geeksforgeeks.org/data-structures-and-algorithms-online-courses-free-and-paid/
3. Coursera – Data Structures Course (University of California San Diego)
   https://www.coursera.org/learn/data-structures
4. edX – Learn Data Structures & Algorithms Courses
   https://www.edx.org/learn/data-structures
5. W3Schools (Data Structures Tutorial Index)
   https://www.w3schools.in/data-structures/tutorials/
6. Google Tech Dev Guide – Data Structures Resources & Practice
   https://techdevguide.withgoogle.com/resources/topics/data-structures/
7. GitHub – DSA Resources (Community Compiled Lists)
   https://github.com/GDSC-KIIT/DSA-Resources

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSECONTENT

BASIC ELECTRICAL ENGINEERING LAB								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
CourseCode	**Category**	**Hours/Week**			**Credits**	**MaximumMarks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EE207ES	**Foundation**	0	0	2	1	40	60	100
ContactClasses:0	**TutorialClasses:00**	**PracticalClasses:30**				**TotalClasses:30**		
Prerequisite: Basic Electrical Engineering								

I COURSEOVERVIEW:

Focuses on hands-on verification of circuit laws and theorems (Ohm's, Kirchhoff's), resonance, series/parallel RLC circuits, Thevenin's/Norton's theorems,practical knowledge on the fundamentals of DC and AC circuits.

II COURSEOBJECTIVES:

The students will try to learn:

1. To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
2. To study the transient response of various R, L and C circuits using different excitations.
3. To determine the performance of different types of DC, AC machines and Transformers.

III COURSEOUTCOMES:

At the end of the course students should be able to:	
CO1:	Verify the basic Electrical circuits through different experiments.
CO2:	Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
CO3:	Analyze the transient responses of R, L and C circuits for different input conditions.

IV COURSECONTENT:

The following experiments are required to be conducted compulsory:
List of experiments/demonstrations:

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

V TEXTBOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

VI REFERENCEBOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. AbhijitChakrabarthi, SudiptaDebnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

VII.ELECTRONICSRESOURCES

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/106/108106172/
3. https://ocw.mit.edu/search/ocwsearch.htm?q=laboratory

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COURSE CONTENT

ENGINEERING WORKSHOP								
B.Tech. I Year II Semester: ECE					**Regulations: R25**			
CourseCode	**Category**	**Hours/Week**			**Credits**	**MaximumMarks**		
25ME209ES	**Foundation**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
		0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: Nill**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:NIL								

I COURSE OVERVIEW:

An Engineering workshop lab provides essential hands-on experience that bridges the gap between theoretical knowledge and practical applications. The course, typically for first-year students, familiarizes them with basic trades (Carpentry, Fitting, Tin smithy, Welding, Foundry, House Wiring, Black Smithy) ,materials, tools, Sequence of operations and safety practices and also Demonstration and exposure on Plumbing, Machine Shop, Metal Cutting , Power tools in construction and Wood Working.

II COURSE OBJECTIVES:

The students will try to learn:

1. To introduce students to basic manufacturing processes and workshop practices.
2. To provide hands-on training in carpentry ,fitting, welding, sheet metal, and machining
3. To develop skills in using hand tools and measuring instruments.
4. To enhance safety awareness and proper handling of workshop equipment
5. To build a foundational understanding of industrial production and fabrication.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Demonstrate various machines, tools and their operations.
CO2:	Apply different workshop trades like fitting, carpentry, foundry and welding
CO3:	Practice workshop trades like Tim smithy, Black smithy
CO4:	Identify suitable tools for different trades of engineering processes including drilling, material removing, measuring, chiseling
CO5:	Apply basic electrical engineering knowledge for house wiring practice.

IV COURSE CONTENT:

1. TRADES FOR EXERCISES: At least two exercises from each trade:

i. **Carpentry:** T-Lap Joint, Dovetail Joint, Mortise and Tenon Joint (4 Hrs)
ii. **Fitting :** V-Fit, Dovetail Fit and Semi-circular fit (4 Hrs)
iii. **Tin Smithy**: Square Tin, Rectangular Tray and Conical Funnel (4 Hrs)
iv. **Foundry**: Preparation of Greensand Mould using Single Piece and Split Pattern (4 Hrs)
v. **Welding Practice:** Arc Welding and Gas Welding (4 Hrs)
vi. **House wiring**: Parallel and Series ,Two-way Switch and Tube Light (2 Hrs)
vii. **Black Smithy**: Round to Square, Fan Hook and S-Hook (4 Hrs)

2. TRADES FOR DEMONSTRATION AND EXPOSURE: (4 Hrs)

Plumbing, Machine Shop, Metal Cutting (Water Plasma),
Power tools in construction and Wood Working.

V TEXT BOOKS:

1. Workshop Practice B.L.Juneja, Cengage Learning India, 1st edition, 2015.
2. Workshop Practice Manual, K.Venkata Reddy, BS publication, 6th Edition, Rpt.2025.

VI REFERENCE BOOKS:

1. Workshop Manual, K.Venu gopal, Anuradha Publications, 2012th edition, 2012.

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COURSE CONTENT

PROBABILITY THEORY AND STOCHASTIC PROCESSES								
B.Tech. II Year I Semester: ECE					**Regulations:** R25			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC301PC	Foundation	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Mathematics								

I COURSE OBJECTIVES:

The students will try to learn:

1. This gives basic understanding of Probability and random variables.
2. This gives basic understanding on operations of multiple random variables.
3. To know the temporal characteristics of Random Process.
4. To know the Spectral characteristics of Random Process.
5. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Apply the Concepts of probability and Random variable to real time applications
CO2:	Analyze probability density and distribution functions for single random variables
CO3:	Analyze probability density and distribution functions for multiple random variables.
CO4:	Determine the temporal characteristics of random processes.
CO5:	Evaluate the spectral density of random Processes

III COURSE CONTENT:

UNIT- I:

Probability: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events.
Random Variables- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT – II:

Operations on single Random Variable
Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable - Monotonic and Non-monotonic Transformations of Continuous and Discrete Random Variable, Computer generation of a Random Variable of a given PDF/CDF.

UNIT - III:

Multiple random variables and Operations on Multiple random variables: Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density– Point and Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution (Proof not expected).

Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - IV:

Random processes – Temporal characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide- Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean- Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross- Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT - V:

Random processes – Spectral characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

IV TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles - TMH, 4th Edition
2. Murray R Spiegel, John Schiller, R Alu Srinivasan. – Probability and Statistics – Schaum's Outlines, 2nd Edition, TMH

V REFERENCE BOOKS:

1. P Ramesh Babu - Probability Theory and Random Processes – McGraw Hill Education
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes – McGraw Hill Education, 4th Edition
3. K. N. Hari Bhat, K. Anitha Sheela and Jayant Ganguly - Probability Theory and Stochastic Processes for Engineers - Pearson, 1st Edition, 2011
4. Taub and Schilling - Principles of Communication systems by (TMH), 2008
5. Y Mallikarjuna Reddy - Probability Theory and Stochastic Processes, 4th Edition, University Press

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COURSE CONTENT

SIGNALS AND SYSTEMS								
B.Tech. II Year I Semester: ECE					**Regulations:** R25			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC302PC	Engineering Sciences	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Mathematics								

I COURSE OBJECTIVES:

The students will try to learn:

1. To develop fundamental knowledge of signal analysis through orthogonal functions, vector spaces, and various signal classifications.
2. To gain understanding of Fourier series and Fourier transforms for frequency-domain representation and signal property analysis.
3. To examine how signals pass through linear systems using impulse response, transfer functions, convolution, and correlation methods.
4. To apply Laplace transform methods for continuous-time signals, focusing on ROC, key properties, and spectral analysis uses.
5. To study discrete-time signal analysis using Z-transform and Sampling theorem with emphasis on reconstruction, aliasing, and system performance.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Characterize various signals, systems and their time and frequency domain analysis, using transform techniques
CO2:	Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
CO3:	Understand the significance of sampling theorem for baseband and band-pass signals for various types of sampling and for different duty cycles
CO4:	Understand the concept of correlation and PSD functions and their applications
CO5:	Apply sampling Theorem and Z-Transform techniques for discrete-time signal analysis and reconstruction

III COURSE CONTENT:

UNIT- I:

Signal Analysis
Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT – II:

Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum. Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT - III:

Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution. Extraction of Signal from Noise by Filtering. Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and risetime. Extraction of Signal from Noise by Filtering.

UNIT - IV:

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.
Correlation: Auto Correlation and Cross Correlation Functions, Relation between Convolution and Correlation, Properties of Correlation Functions, Energy Density Spectrum, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Parseval's Theorem, Detection of Periodic Signals in the presence of Noise by Correlation.

UNIT - V:

Sampling theorem: Graphical and analytical proof of Sampling Theorem for Base band/Band Limited and Band Pass Signals, Types of Sampling: Impulse Sampling, Natural and Flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing,
Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

IV TEXT BOOKS:

1. Signals, Systems & Communications -B.P. Lathi, BS Publications.
2. Signals and Systems – Allan. V. Oppenheim, Allan. S. Willsky with S. Hamid. Nawab, 2nd Ed. Pearson.

V REFERENCE BOOKS:

1. Signals and Systems–Simon Haykin, Barry Van Veen, 2nd Ed., Wiley.
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH.
3. Fundamentals of Signals and Systems – Michel J. Roberts, Govind Sharma, 2nd Ed., MGH.
4. Signals, Systems and Transforms - Charles. L. Philips, John M. Parr and Eve A. Riskin, 4th Ed., 2004, Pearson, Prentice Hall.

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COURSE CONTENT

ELECTRONIC DEVICES AND CIRCUITS								
B.Tech. II Year I Semester: ECE					**Regulations:** R25			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC303PC	Engineering Sciences	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite:								

I COURSE OVERVIEW:

This course introduces fundamental semiconductor devices and their behavior, including diodes, BJTs, and FETs. It covers their characteristics, applications, and the analysis of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

II COURSE OBJECTIVES:

The students will try to learn:

1. To understand the characteristics of semiconductor diodes and its applications.
2. To understand the operations and Characteristics of BJT configurations.
3. To analyze the Biasing techniques for BJT.
4. To analyze the transistor parameters in various configurations.
5. To acquire the knowledge of special purpose electronic devices and their application.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.
CO2:	Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.
CO3:	Evaluate the various biasing networks for BJTs and determine the operating point for amplifier
CO4:	Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.
CO5:	Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like Fin FETs and CNTFETs, and acquire the knowledge of special purpose devices.

IV COURSE CONTENT:

UNIT- I:

Diode Characteristics and Applications: PN junction diode – I-V characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers – Half-wave, Full wave (Center-tap and bridge), Capacitor filter for rectifiers, Clippers and clampers, Zener diode – I-V characteristics and voltage regulation.

UNIT – II:

Bipolar Junction Transistor (BJT): Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics, Determination of h-parameters from transistor characteristics

UNIT - III:

BJT Biasing: Need for biasing and stabilization, Load line and operating point, Biasing techniques: Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway

UNIT - IV:

Transistor Amplifiers: Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V:

Special Purpose Diodes: Principle of Operation of – SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics, **MOSFET:** Enhancement and Depletion modes – Structure, operation, and characteristics, Introduction of Advanced Devices: FinFETs and CNTFETs

V TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. Electronic Devices and Circuits. Tata McGraw-Hill, 1991.
2. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. Pearson, 11th ed., 2013.
3. Sedra, Adel S., and Kenneth C. Smith. Microelectronic Circuits. Oxford University Press, 7th ed., 2014.

VI REFERENCE BOOKS:

1. Bell, David A. Electronic Devices and Circuits. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. Electronic Circuit Analysis and Design. McGraw-Hill, 2nd ed., 2001.
3. Salivahanan, S., and N. Suresh Kumar. Electronic Devices and Circuits. McGraw-Hill Education, 4th ed., 2017.
4. Razavi, Behzad. Fundamentals of Microelectronics. Wiley, 2nd ed., 2013.
5. Taur, Yuan, and Tak H. Ning. Fundamentals of Modern VLSI Devices. Cambridge University Press, 2nd ed., 2009.

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COURSE CONTENT

DIGITAL LOGIC DESIGN								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC304PC	**Engineering Sciences**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite:								

I COURSE OVERVIEW:

This course introduces students to the fundamental principles of digital logic design. Starting from Boolean algebra and its simplification techniques, it covers the formal analysis and design of combinational and sequential circuits. Additionally, the course addresses memory elements and programmable logic devices, which are essential building blocks for complex digital systems

II COURSE OBJECTIVES:

The students will try to learn:

1. Understand common forms of number representation in digital system and reduce the expressions using Boolean algebra theorems and properties
2. Inculcate the concepts of K-Map to simplify Boolean expression and implement using NAND/NOR gates
3. Understand the analysis and designing procedures of combinational logic circuits using Logic gates
4. Understand the analysis and designing procedures of sequential logic circuits using Flip Flops.
5. Understand the concept of sequential machine designing using the FSM and PLD in Digital System

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Apply Boolean algebra and minimization techniques to simplify Boolean functions
CO2:	Design combinational circuits using logic gates
CO3:	Analyze latches and flip-flops to design sequential logic circuits.
CO4:	Construct synchronous sequential circuits combining flip-flops and logic gates.
CO5:	Design the sequential Machines using Moore and Mealy models and utilize programmable logic devices in digital system.

IV COURSE CONTENT:

UNIT- I:

Number Systems: Binary, Octal, Decimal, Hexadecimal, Fixed-point and Floating-point Number Representations, Complements of Numbers: 1's and 2's Complement, Error Detection and Correction Codes: Parity Check, Hamming Code.
Boolean Algebra and Logic Gates: Axiomatic definitions, basic theorems and properties, Boolean Functions: Canonical and standard forms, Digital Logic Gates Overview.

UNIT – II:

Gate-Level Minimization Techniques: Karnaugh maps: 2, 3, and 4 variables, Sum-of-products (SOP) and product-of-sums (POS) simplification, Don't care conditions, Implementation using NAND and NOR gates.

UNIT - III:

Combinational Logic Circuits: Analysis and design procedures, Binary adder-subtractor and BCD adder, magnitude comparator, decoders, encoders, multiplexers and demultiplexers.

UNIT - IV:

Sequential Logic Circuits: Gated latches, Flip-flops: Clocked S-R, D, T, JK, Master-Slave JK, Design of synchronous and asynchronous counters, Shift registers: types and applications.

UNIT - V:

Synchronous Sequential Logic Moore and Mealy state machines, State diagrams, state tables, and state reduction, Case studies: sequence detector, traffic light controller, vending machine.

Programmable Logic Devices: Memory devices - RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL)

V TEXT BOOKS:

1. M. Morris Mano, Michael D. Ciletti, Digital Design with an Introduction to the Verilog HDL, 6th Edition, Pearson Education/PHI, 2017.

VI REFERENCE BOOKS:

1. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, 10th Edition, Pearson Education.
2. Charles H. Roth Jr., Larry L. Kinney, Fundamentals of Logic Design, 6th Edition, Cengage Learning.

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COURSE CONTENT

CONTROL SYSTEMS								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC305PC	**Engineering Sciences**	2	0	0	2	40	60	100
Contact Classes: 30	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 30**		
Prerequisite: Electrical Circuits-I & II and Electrical Machines-I								

I COURSE OBJECTIVES:

The students will try to learn:

1. Understand the mathematical modelling of physical systems.
2. Comprehend the representation of dynamical systems through input-output models, including transfer functions and state-space models.
3. Understand the design of controllers and compensators to enhance the performance and stability of dynamical systems

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Develop mathematical models of physical systems and analyze feedback control concepts using transfer functions, block diagrams, and signal flow graphs.
CO2:	Analyze time-domain response of control systems and evaluate stability using Routh-Hurwitz and Root-Locus techniques.
CO3:	Evaluate the frequency response of control systems and determine stability using Bode, Polar, and Nyquist plots.
CO4:	Design and analyze control systems using PID controllers and lead, lag, and lead-lag compensators.
CO5:	Apply state variable analysis to model dynamic systems and examine their controllability and observability.

III COURSE CONTENT:

UNIT- I:

Mathematical modelling of physical systems: Open – loop and Closed loop Systems, Concept of Feedback Control, Benefits of Feedback and Effects of feedback, Linear, Non-Linear, Time Variant and Time Invariant systems, Mechanical and Electrical Systems. Transfer function, Block-Diagram Techniques, Signal flow graph, Controller Components: DC Servo motors, AC Servomotors, Synchro's.

UNIT – II:

Time-Domain Analysis with Input-Output Models: Time response of first and second order systems for standard test inputs. Analysis of standard Second order systems with step input, Types of System, Error Analysis for Linear time Invariant Systems, Design specifications for second-order systems based on the time-response. Concept of Stability: Routh-Hurwitz Criteria. Relative Stability analysis, Root-Locus technique: Construction of Root-loci.

UNIT - III:

Frequency Domain Analysis: Introduction to frequency response, Relationship between time and frequency response, Concept of Bode plots and construction. Polar plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin

UNIT - IV:

Classical Controllers and Compensators: Proportional, Integral and Derivative Controllers- PI, PD and PID controllers, Lead, Lag and Lead-Lag compensators (elementary treatment only).

UNIT - V:

State Variable Analysis: Concept of State, State variables and State model. State Representation, Transformation of State variables, Solution of state equations and Complete response of the Systems. Concept of controllability and observability.

IV TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. Norman S Nise, "Control Systems Engineering", Wiley, 2019 8th Edition.

V REFERENCE BOOKS:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. K. R. Varmah, "Control Systems", McGraw Hill Education, 2010.

VI ELECTRONICS RESOURCES:

1. https://www.controleng.com
2. https://www.mathworks.com
3. https://nptel.ac.in/courses/108/102/108102043/

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

INNOVATION AND ENTREPRENEURSHIP								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25MS306HS	**Foundation**	2	0	0	2	40	60	100
Contact Classes: 30	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 30**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

1. To familiarize on the basic concepts of innovation, entrepreneurship and its importance.
2. To Identify and analyze the process of problem-opportunity identification, market segmentation, and idea generation techniques.
3. To initiate prototype development and understand minimum viable product.
4. To develop initial Business and financial planning and Go-to-Market strategies
5. To impart knowledge on establishing startups, venture pitching and IPR

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.
CO2:	Assess the problem from an industry perspective and generate solutions using the design thinking principles
CO3:	Assess market competition, estimate market size, and develop a prototype
CO4:	Analyze Business and financial planning models and Go-to-Market strategies
CO5:	Able to build a start-up, register IP and identify funding opportunities

III COURSE CONTENT:

UNIT- I:

Fundamentals of Innovation and Entrepreneurship

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation.

Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and intrapreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups. Understanding to build entrepreneurial mindset, attributes and networks individuals while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

UNIT – II:

Problem and Customer Identification

Identification of gap, problem, analyzing the problem from a industry perspective, real-world problems, market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, Brain writing, Round robin, and SCAMPER, Design thinking principles, Mapping of solution to problem.

Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

UNIT - III:

Opportunity assessment and Prototype development

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity.

Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

UNIT - IV:

Business & Financial Models

Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model, building lean canvas for your startup. Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, Economies of Scale and analyzing financial performance. Go-To-Market (GTM) approach – Selecting the Right Channel, creating digital presence, and building customer acquisition strategy.

Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

UNIT - V:

Startups and IPR

Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, institutional support to entrepreneurs, startup lifecycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP) and its features.

Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

IV SUGGESTED READINGS:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, The Stratup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).
3. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
4. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
5. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
6. NISP -Brochure inside pages - startup_policy_2019.pdf

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

MODELLING & SIMULATION LAB								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC307PC	**Engineering Sciences**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OVERVIEW:

1. Will be able to use a simulation tool for generating, analyzing and performing various operations on Signals / Sequences both in time and Frequency domain
2. Will be able to use a simulation tool for Analyzing and Characterizing Continuous and Discrete Time Systems both in Time and Frequency domain along with the concept of Sampling
3. Will be able to use a simulation tool for generating different Random Signals;
4. analyze their Characteristics by finding different higher order Moments and noise removal applications
5. Will be able to use a simulink for Control System applications

II COURSE OBJECTIVES:

The students will try to learn:

1. To generate, synthesize, and analyze signals with basic operations and power/energy computation.
2. To study properties and responses of continuous and discrete LTI systems.
3. To analyze signals in frequency domain using Fourier, Laplace, and Z-transforms.
4. To simulate random variables, distributions, Gaussian noise, and statistical measures.
5. To apply signal processing for sampling, noise removal, signal extraction, and system modelling

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Perform signal generation, synthesis, and analysis, including basic operations and computation of power/energy.
CO2:	Examine the characteristics and responses of continuous and discrete-time LTI systems.
CO3:	Apply Fourier, Laplace, and Z-transform methods for frequency-domain signal analysis
CO4:	Simulate and analyze random variables, probability distributions, Gaussian noise, and statistical parameters.
CO5:	Implement signal processing techniques for sampling, noise removal, signal extraction, and system modeling.

IV LIST OF EXPEREMENTS:

Signals and Systems (Minimum 7 Experiments):

1. Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Sawtooth, Triangular, Sinusoidal, Ramp, Sinc and Nonstandard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis. Also, for perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.
2. Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
3. Write the code / script for finding the output of a System for a given input and Impulse Response and finding Auto Correlation and Cross Correlation of Signals / sequences
4. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant, Stable and Physically Realizable
5. Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.
    a) Plot the Real and Imaginary part and
    b) Magnitude and Phase Plot of the response
6. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.
7. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever required. Also plot pole-zero diagram in S-plane
8. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform by using the properties wherever required. Also plot pole – zero diagram in Z-plane
9. Design a Simulink or equivalent model for
    a) Solving Differential Equations
    b) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses
10. Gibbs Phenomenon and waveform synthesis

Probability Theory and Stochastic Processes (Minimum 3 Experiments)

1. Write the code / script for generating various Random Variables with different CDFs/ PDFs
2. Write the code / script for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
3. Write the code / script for Verifying Sampling theorem for different sampling rates, Sampling types and Duty Cycles and for plotting the sampled and reconstructed Signals.
4. Write the code / script for Removal of noise from the signal using Cross correlation.
5. Write the code / script for Extraction of Periodic Signal masked by noise using Auto Correlation

Control Systems (Minimum 2 Experiments)

1. Build and Simulate a DC Motor using Simulink
2. Implementation of a PID Controller from equations using Simulink 18. Controllability and Observability

Note: For the experiments with code/scripts written in MATLAB or equivalent (1-8, 11-15), the student can design a user interface or app using MATLAB App Designer or equivalent.

V Applications on Real Time Signals:

1. Application of Autocorrelation: GPS Synchronization Satellite communication toolbox is required for this experiment.

Generate the GPS signal. Visualize the GPS signal. Plot of autocorrelation of C/A code and visualize the spectrum of GPS signals. For exact steps, go through the following page:
https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html

2. Sampling of Speech Signals

Record and play speech in MATLAB. For steps, go through the following page:
https://in.mathworks.com/help/matlab/import_export/record-and-play-audio.html

Change the sampling rate of the recorded speech signal and play back to see the effect of aliasing. For steps, go through the following page:
https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

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Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

ELECTRONIC DEVICES AND CIRCUITS LAB								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC308PC	**Engineering Sciences**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I.COURSE OVERVIEW:

This laboratory course aims to provide hands-on experience and simulation-based learning of semiconductor devices and basic electronic circuits. Students will analyze the characteristics and applications of diodes, BJTs, and FETs, design rectifiers and amplifiers, and simulate modern electronic circuits using software tools. The course bridges theoretical concepts with practical implementation, developing foundational skills essential for analog electronics and circuit analysis.

I

II COURSE OBJECTIVES:

The students will try to learn:

1. To understand the characteristics of semiconductor diodes, BJTs and FETs.
2. To understand the design, operation of rectifier, clipper, clamper, and voltage regulation circuits.
3. To analyze the Biasing techniques for BJT.
4. To analyze the transistor parameters in various configurations.
5. To acquire the knowledge on Simulation tools

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Analyze the I–V characteristics of semiconductor devices such as diodes, BJTs, and FETs.
CO2:	Design and evaluate basic rectifier, clipper, clamper, and voltage regulation circuits
CO3:	Demonstrate biasing techniques for BJTs and determine their operating point using DC load line analysis
CO4:	Design and analyze transistor amplifier circuits in various configurations using h-parameter models.
CO5:	Simulate and interpret electronic circuits using appropriate simulation tools.

IV LIST OF EXPEREMENTS:

A. Hardware-Based Experiments (7):

1. Study the I–V characteristics of a PN junction diode in forward and reverse bias to determine cut-in voltage and dynamic resistance.
2. Examine the reverse bias characteristics of a Zener diode and demonstrate its application as a voltage regulator under varying conditions.
3. Design and analyze half-wave and full-wave rectifiers (center-tap and bridge) with and without capacitor filters to evaluate ripple factor and output voltage.
4. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
5. Plot the input and output characteristics of a BJT in common emitter configuration to determine input/output resistance and current gain.
6. Design and test fixed bias and voltage divider bias circuits to establish a stable operating point for a BJT amplifier and study DC load line behavior.
7. Construct and analyze a Common Base (CB) configuration of a BJT to study input-output characteristics and determine current gain (α) and input/output resistance.

B. Software-Based Simulation Experiments (7):

1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate a common emitter amplifier with and without emitter bypass capacitor to analyze the effect on voltage gain and signal amplification.
4. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
5. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
6. Simulate the characteristics of a MOSFET and design a CMOS inverter to study digital switching behavior and low-power logic design.
7. Simulate the transfer and output characteristics of an enhancement-mode NMOS transistor to analyze threshold voltage, drain current, and switching behavior

Hardware Requirements:

1. Regulated DC Power Supply (0–30V)
2. Function Generator
3. Digital Multimeter
4. Cathode Ray Oscilloscope (CRO) or DSO
5. Breadboards and Connecting Wires
6. Resistors, Capacitors, Diodes (1N4007, Zener Diodes)
7. BJTs (e.g., BC107, 2N2222), JFETs (e.g., J201), MOSFETs (e.g., IRF540N)
8. Trainer Kits (optional but preferred for ease)

Software Requirements (Any one of the listed tools or equivalent):

1. LTSpice (Free from Analog Devices)
2. NI Multisim (Academic License or Student Version)
3. Proteus Design Suite (Simulation and PCB Design)
4. TINA-TI (Free from Texas Instruments)
5. PSPICE for TI or OrCAD Lite
6. Windows PC or Laptop with minimum 4GB RAM and i3 processor or better

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COURSE CONTENT

DIGITAL LOGIC DESIGN LABORATORY								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC309PC	**Engineering Sciences**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

1. Implementation of the given Boolean functions using logic gates and verify its Truth tables
2. Implementation of the logic gates using universal gates and verify its truth tables.
3. Design the combinational logic circuits (Adder, Subtractor, Multiplexer, De-Multiplexer, Encoder, Decoders) and Sequential logic circuits (Flip flops, Counters, Shift Registers).
4. Design and simulate combinational and Sequential logic circuits using behavioural modeling.
5. Understand the concept of sequential machine and design using the FSM.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems
CO2:	Define Postulates of Boolean algebra and to minimize combinational functions, and Design the combinational circuits
CO3:	Design and analyze sequential circuits for various cyclic functions.
CO4:	Characterize the logic families and analyze the mforthe purpose of AC and DC parameters
CO5:	Design and analyze the Finate state machines-FSM’s

III LIST OF EXPEREMENTS:

1. Realization of Logic circuit to generate r's Compliment using Logic Gates
2. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
3. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtract or using full adder
4. Designing a 2 – bit Comparator using AND, OR and NOT gates. Realize 4 – bit Comparator using 2 – bit Comparators
5. Realize 2:1 MUX using the given gates and Design 8:1 using 2:1 MUX
6. Implement the given Boolean function using the given MUX (ex: code converters)
7. Realize a 2x4 Decoder using logic gates and implement 3x8 Decoder using 2x4 Decoder
8. Implement the given Boolean function using given Decoders.
9. Convert Demultiplexer to Decoder and vise versa
10. Verification of truth tables of flip-flops using different clocks (level triggering, positive and negative edge triggering) also converts the given flipflop from one type to other
11. Designing of Universal n-bit shift register using flipflops and Multiplexers. Draw the timing diagram of the Shift Register.
12. Design a Synchronous binary counter using D-flipflop/given flipflop
13. Design a asynchronous counter for the given sequence using given flipflops
14. Designing of MOD 8 Counter using JK flipflops
15. Designing of sequence detecting State Machine with minimal states using the given flip-flops.
16. Designing of Parity Bit(even/odd) generator using the given flipflops
17. Realize all logic gates with TTL logic. 18. Realize all logic gates with DTL logic. *Design a sequence detector to detect a given sequence and verify practically *Design a serial subtractor for 4 bit binary numbers

Major Equipment required for Laboratories:

1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply
2. 20 MHz Oscilloscope with Dual Channel.
3. Bread board and components/ Trainer Kit.
4. Multimeter.

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COURSE CONTENT

LINUX AND SHELL SCRIPTING								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC310SD	**Foundation**	0	0	2	1	40	60	100
Contact Classes:0	**Tutorial Classes:0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

1. To enable the students to study and understand the efficiency of Linux shell script.
2. To demonstrate the File Backup process.
3. To develop and implement the shell script for GUI processing.
4. To develop and implement the shell script for IPC and Networking.
5. To demonstrate PostgreSQL.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	To understand, apply and analyze the concepts and methodology of Linux shell programming
CO2:	To comprehend, impart and apply fundamentals of control structure and script controls
CO3:	To understand, analyses and evaluate the functions, graphical desktop interface and editors
CO4:	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk
CO5:	To comprehend, use and analyze the advance concepts

III LIST OF EXPERIMENTS

1. Write a Shell Script program to calculate the number of days between two dates.
2. Write a Shell Script program to check systems on local network using control structures with user input.
3. Write a Shell Script program to check systems on local network using control structures with file input.
4. Write a Shell Script program to demonstrate the script control commands.
5. Write a Shell Script program to demonstrate the Shell script function.
6. Write a Shell Script program to demonstrate the Regular Expressions.
7. Write a Shell Script program to demonstrate the sed and awk Commands.
8. Write a Shell Script program to demonstrate the File Backup process through creating a daily archive location.
9. Write a Shell Script program to create a following GUI tools. a) Creating text menus

b) Building text window widgets

10. Write a Shell Script program to demonstrate to connect a PostgreSQL database and performing CRUD operations.

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COURSE CONTENT

ENVIRONMENTAL SCIENCE								
B.Tech. II Year I Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25VA300ES	**Foundation**	1	0	0	1	100	00	100
Contact Classes: 15	**Tutorial Classes:0**	**Practical Classes: Nil**				**Total Classes: 15**		
Prerequisite:								

IV COURSE OBJECTIVES:

The students will try to learn:

1. Understand the components, structure, and functions of ecosystems and their relevance to human society.
2. Comprehend classification, sustainable management, and challenges of natural resources including water, minerals, land, forests, and energy.
3. Grasp the significance, value, and conservation approaches for biodiversity, including threats and legislative frameworks.
4. Analyze types, sources, and impacts of environmental pollution, and learn technological and policy measures for pollution prevention and control.
5. Develop awareness about global environmental challenges, international agreements, and the role of policy, law, and Environmental Impact Assessment (EIA) in sustainable development.

V COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Understand the structure, function, and significance of ecosystems, including energy flow, biogeochemical cycles, and biodiversity conservation through field experiences.
CO2:	Analyze the classification, utilization, and sustainable management of natural resources, along with alternative energy options
CO3:	Evaluate biodiversity at genetic, species, and ecosystem levels, its values, threats, and conservation methods under national and international frameworks
CO4:	Identify types, sources, and impacts of environmental pollution, and apply suitable control technologies while assessing global environmental challenges and protocols.
CO5:	Interpret environmental policies, legislation, and the EIA process to propose management plans addressing contemporary environmental and sustainability issues.

VI COURSE CONTENT:

UNIT- I:

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT – II:

Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources**: use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources**: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III:

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: InSitu and Ex-situ conservation. National Biodiversity act.

UNIT - IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.
Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies**: Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives

UNIT - V:

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP). Contemporary Environmental Issues Climate change; Sustainable development goals (SDGs); Global environmental challenges; Environmental policies and international agreements

VII TEXT BOOKS:

1. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
3. Environmental Studies by R. Rajagopalan, Oxford University Press.

VIII REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

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COURSE CONTENT

NUMERICAL METHODS AND COMPLEX VARIABLES								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25MA401BS	**Foundation**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Mathematics courses of first year of study								

I COURSE OBJECTIVES:

The students will try to learn:

1. Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
2. Various numerical methods to find roots of polynomial and transcendental equations.
3. Concept of finite differences and to estimate the value for the given data using interpolation.
4. Evaluation of integrals using numerical techniques
5. Solving ordinary differential equations of first order using numerical techniques.
6. Differentiation and integration of complex valued functions.
7. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
8. Expansion of complex functions using Taylor's and Laurent's series.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Express any periodic function in terms of sine and cosine.
CO2:	Find the root of a given polynomial and transcendental equations.
CO3:	Estimate the value for the given data using interpolation
CO4:	Find the numerical solutions for a given first order ODE's
CO5:	Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems. Taylor's and Laurent's series expansions in complex function.

III COURSE CONTENT:

UNIT- I:

Fourier Series & Fourier Transforms
Fourier series – Dirichlet's Conditions – Half-range Fourier series – Fourier Transforms: Fourier Integral Theorem (Only statements), Fourier Sine and Cosine transforms (Elementary illustrations)

UNIT – II:

Numerical Methods-I
Solution of polynomial and transcendental equations: Bisection method – Iteration Method – Newton-Raphson method and Regula-Falsi method. Finite differences: forward differences – backward differences – central differences – symbolic relations – Interpolation using Newton's forward and backward difference formulae – Lagrange's method of interpolation.

UNIT - III:

Numerical Methods-II
Numerical integration: Trapezoidal rule - Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.
Ordinary differential equations: Taylor's series – Euler's method – Runge-Kutta method of fourth order for first order ODE.

UNIT - IV:

Complex Differentiation
Differentiation of Complex functions – Analyticity – Cauchy-Riemann equations (without proof) – Harmonic Functions – Finding harmonic conjugate – Milne-Thomson method – Elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT - V:

Complex Integration
Line integral – Cauchy's theorem – Cauchy's Integral formula – Zeros of analytic functions – Singularities – Taylor's series – Laurent's series. Residues – Cauchy Residue theorem (All theorems without Proof).

IV TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36^{th} Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

V REFERENCE BOOKS:

1. Murray R. Spiegel, Ph.D., Seymour Lipschutz, Ph.D., John J. Schiller, Ph.D., Dennis Spellman, Ph.D., Complex Variables (Schaum's outline).
2. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9^{th}Edition, John Wiley &Sons, 2006.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7^{th} Edition, Mc-Graw Hill, 2004.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC402PC	**Engineering Sciences**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Mathematics								

I COURSE OBJECTIVES:

The students will try to learn:

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields and apply them to solve physics and engineering problems.
2. To learn the Basic Laws, Concepts related to Magneto static Fields, and apply them to solve physics and engineering problems.
3. To distinguish between static and time-varying fields and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
4. To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.
5. To analyze the propagation of waves in transmission line and able to solve transmission line problem using Smith Chart.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Apply the characteristics of basic laws of Electrostatics.
CO2:	Use the basic laws of Magnetostatics.
CO3:	Apply Maxwell's equations at different boundaries.
CO4:	Analyze Wave Propagations in conductors and dielectrics
CO5:	Evaluate transmission line parameters.

III COURSE CONTENT:

UNIT- I:

Electrostatics

Review of Coordinate Systems & Vector Calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and its applications, Electric Potential, Relation between E and V, Maxwell's Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitors–Parallel Plate, Coaxial, Spherical

UNIT – II:

Magnetostatics

Biot-Savart's Law, Ampere's Circuit Law and its applications, Magnetic Flux Density, Maxwell's equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNIT - III:

Maxwell's Equations (Time Varying Fields)

Faraday's Law, Transformer and Motional EMF, Inconsistency in Ampere's Law and Displacement Current Density, Maxwell's Equations in Differential, Integral and Phasor form.
Electric and magnetic Boundary Conditions (Dielectric – Dielectric, Conductor– Dielectric, Conductor– Free Space interfaces).

UNIT - IV:

EM Wave Characteristics

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves–Definitions, Relation between E&H, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Skin Depth, Surface Impedance, Wave Polarization. Poynting Vector and Poynting Theorem.
Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection,

UNIT - V:

Transmission Lines

Types, Parameters, Equivalent Circuit, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless Lines, Types of Distortions, condition for Distortion less transmission lines, Minimum Attenuation, Loading – Types of Loading, Input Impedance, SC and OC Lines, Reflection Coefficient, VSWR, Impedance Transformations - $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines, Smith Chart- Configuration and Applications, Single Stub Matching.

IV TEXT BOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck,8thEd., McGrawHill,2014
2. Principles of Electromagnetics –Matthew N.O. Sadiku and S.V. Kulkarni, 6thEd., Oxford University Press, Asian Edition, 2015.

V REFERENCE BOOKS:

1. Electromagnetic Waves and Radiating Systems–E.C. Jordan and K.G. Balmain,2ndEd., PHI,2000.
2. Engineering Electromagnetics – NathanIda, 2ndEd., Springer (India) Pvt. Ltd., New Delhi,2005.
3. Electromagnetic Field Theory Fundamentals –Bhag Singh Guru and Husey in R. Hiziroglu, Cambridge University Press, 2nd Ed., 2006.

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Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

ANALOG AND DIGITAL COMMUNICATIONS								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC403PC	**Engineering Sciences**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Signals and Systems								

I COURSE OBJECTIVES:

The students will try to learn:

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand each block in AM, FM transmitters and receivers
3. To acquire theoretical knowledge of Pulse modulation & Pulse digital modulation.
4. To understand the concepts of digital modulation techniques.
5. To understand the concept of information theory and application of source coding schemes.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Analyze different amplitude modulation schemes and assess their performance
CO2:	Evaluate various angle modulation schemes
CO3:	Understand the concept of pulse analog and digital modulation schemes and compare their performance
CO4:	Analyze various Digital Modulation and Demodulation techniques.
CO5:	Interpret the concept of information theory and apply source coding schemes.

III COURSE CONTENT:

UNIT- I:

Amplitude Modulation:
Need for modulation, Amplitude Modulation: Time and frequency domain description, Generation – Switching modulator, Detection - Envelope detector, DSB-SC Modulation: Generation – Balanced Modulator, Detection- Synchronous detector, COSTAS Loop, SSB Modulation: Time and frequency domain description, Generation – Phase discrimination Method and Demodulation - coherent detection, Vestigial side band modulation and demodulation. , AM Transmitters, AM Receiver - Super heterodyne receiver, Noise analysis in AM

UNIT – II:

Angle Modulation:
Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis, Carson's Rule, Generation of FM Waves- Armstrong Method, Detection of FM Waves - Phase locked loop, FM Transmitters, FM Receivers, Noise analysis in FM, Comparison of FM and AM Transmitters & Receivers, Pre-emphasis and de-emphasis

UNIT - III:

Pulse modulation:
Types of Pulse modulation-PAM, PWM and PPM, Comparison of FDM and TDM.
Pulse Digital modulation
Model of Digital Communication Systems, Geometric Interpretation of Signals, PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, DM and Adaptive DM, Noise in PCM and DM

UNIT - IV:

Digital Modulation Techniques:
Line encoding formats, Digital Modulation formats, Coherent binary modulation techniques (BPSK, BFSK), Coherent quadrature modulation techniques (QPSK), Non-Coherent binary modulation techniques (BFSK, DPSK), QAM, M-ary modulation techniques (PSK, FSK, QAM), Comparison of M-ary digital modulation techniques, constellation diagrams & Eye pattern

UNIT - V:

Information theory: Entropy, Information rate, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade-off between bandwidth and SNR.
Source coding - Huffman coding, Shannon Fano coding, Channel coding - Linear block codes and cyclic codes.

IV TEXT BOOKS:

1. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, PHI, 2009.
2. Digital and Analog Communication System – K. Sam Shanmugam, Wiley, 2019.
3. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.

V REFERENCE BOOKS:

1. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition, PEA, 2004
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004
3. Communication System - Simon Haykin and Michael Moher, Wiley, 5th edition, 2022

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COURSE CONTENT

ELECTRONIC CIRCUIT ANALYSIS								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC404PC	**Engineering Sciences**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: EDC basics								

I COURSE OVERVIEW:

The Electronic Circuit Analysis course provides foundational and advanced knowledge in the design and analysis of analog electronic circuits. This includes the study of multistage amplifiers, feedback amplifiers, oscillators, power amplifiers, and multivibrators. Emphasis is placed on frequency response, feedback theory, transistor behavior at high frequencies, and waveform generation techniques. The course equips students with the necessary analytical and practical skills required in analog circuit design and

II COURSE OBJECTIVES:

The students will try to learn:

1. Learn the concepts of multi stage amplifiers and high –frequency transistor model.
2. To familiarize the Concept of negative feedback in amplifiers
3. To understand the principle of operation of LC, RC and Crystal Oscillators.
4. To learn the concept of Power Amplifiers.
5. To study the operation of various multivibrators and sweep circuits using transistors.

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Analyze the multistage amplifiers and transistor at high frequencies
CO2:	Examine feedback amplifier types and assess the influence of negative feedback on gain, stability, bandwidth and distortion
CO3:	Design RC, LC and Crystal Oscillators based on Barkhausen Criteria to generate the sinusoidal waveforms.
CO4:	Design Power Amplifiers and evaluate their performance in terms of efficiency, distortion and waveform generation
CO5:	Design Multivibrators and Sweep circuits using transistors

IV COURSE CONTENT:

UNIT- I:

Multistage Amplifiers: Classification of Amplifiers, Distortion in Amplifiers, Coupling schemes: RC, Transformer, Direct coupling, Frequency response of multistage amplifiers, Transistor configuration choice in cascade amplifiers, Cascade and Cascode amplifiers, Darlington pair amplifier.
High-Frequency Transistor Model: Hybrid-π model, Hybrid-π parameters: Conductances and capacitances, CE short-circuit current gain, Gain with resistive load and gain-bandwidth product

UNIT – II:

Feedback Amplifiers: Concept and need for feedback in amplifiers, Types and classification of feedback amplifiers, Characteristics of negative feedback: Gain stability, bandwidth, noise, distortion, Voltage series, Voltage shunt, Current series, Current shunt configurations.

UNIT - III:

Oscillators: Principle of positive feedback, Barkhausen Criterion for oscillations, LC Oscillators: Generalized analysis, Hartley, Colpitts, RC Oscillators: RC phase shift, Wien bridge, Crystal oscillator: Working and advantages

UNIT - IV:

Power Amplifiers: Classification: Class A, B, AB, C, Series-fed Class A amplifier, Transformer coupled Class A amplifier, Class B amplifier: Push-pull, Complementary symmetry, Efficiency calculations and Crossover distortion.

UNIT - V:

Multivibrators: Analysis and design of Bistable, Monostable and Astable multivibrators and Schmitt Trigger using transistors.
Time Base Generators: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators, Linearity improvement techniques

V TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. Electronic Devices and Circuits. McGraw-Hill Education, 2008.
2. Bell, David A. Electronic Devices and Circuits. Oxford University Press, 2008.
3. Sedra, Adel S., and Kenneth C. Smith. Microelectronic Circuits. 7th ed., Oxford University Press, 2015.

VI REFERENCE BOOKS:

1. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. 11th ed., Pearson Education, 2013.
2. Millman, Jacob, and Arvin Grabel. Microelectronics. 2nd ed., McGraw-Hill, 1987.
3. Malvino, Albert Paul. Electronic Principles. 7th ed., McGraw-Hill Education, 2007.
4. Millman, Jacob, and Herbert Taub. Pulse, Digital, and Switching Waveforms. McGraw-Hill Education, 1991.

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COURSE CONTENT

LINEAR AND DIGITAL IC APPLICATIONS								
B.Tech. II Year II Semester: ECE					**Regulations:** R25			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC405PC	Engineering Sciences	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: 0**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Switching Theory and Logic Design								

I COURSE OBJECTIVES:

The students will try to learn:

1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non - linear applications of operational amplifiers
3. To introduce the theory and applications of analog multipliers and PLL.
4. To teach the theory of ADC and DAC.
5. To understand and implement the working of basic digital circuits.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Apply the inverting, non-inverting and differential concepts of Op-Amp.
CO2:	Demonstrate the applications of op- Amp, 555 timer and PLL.
CO3:	Analyzes the operation of ADC and DAC.
CO4:	Understanding of the different families of digital integrated circuits and their characteristics
CO5:	Design the sequential logic circuits and architecture of memories

III COURSE CONTENT:

UNIT- I:

Operational Amplifier

Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT – II:

Op-Amp, IC-555 & IC565 Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, principle and Applications.

UNIT - III:

Data Converters

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2Rladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV:

Combinational Logic ICs

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V:

Sequential Logic IC's and Memories

Familiarity with commonly available 74XX & CMOS40XX Series ICs– All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

IV TEXT BOOKS:

1. Op-Amps & Linear ICs– Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals –Floyd and Jain, Pearson Education,8th Ed., 2005

V REFERENCE BOOKS:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Digital Design Principles and Practices–John. F. Wakerly, Pearson 3rd Ed., 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH, 2008.
4. OperationalAmplifierswithLinearIntegratedCircuits,4th Ed., William D. Stanley, Pearson Education India, 2009.

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COURSE CONTENT

COMPUTATIONAL MATHEMATICS LAB (Using Python/MATLAB software)								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25MA406PC	**Foundation**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite: Matrices, Iterative methods and ordinary differential equations								

I COURSE OBJECTIVES:

The students will try to learn:

1. Solve problems of Eigen values and Eigen Vectors using Python/MATLAB.
2. Solution of Algebraic and Transcendental Equations using Python/MATLAB
3. Solve problems of Linear system of equations
4. Solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Develop the code to find the Eigen values and Eigen Vectors using Python/MATLAB
CO2:	Develop the code find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
CO3:	Write the code to solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

III COURSE CONTENT:

UNIT- I:

Eigen values and Eigenvectors:
Programs:
- Finding real and complex Eigen values.
- Finding Eigen vectors.

UNIT – II:

Solution of Algebraic and Transcendental Equations
Bisection method, Newton Raphson Method
Programs:
- Root of a given equation using Bisection method.

Root of a given equation Newton Raphson Method

UNIT - III:

Linear system of equations:
Jacobi's iteration method and Gauss-Seidal iteration method
Programs:
- Solution of given system of linear equations using Jacobi's method
- Solution of given system of linear equations using Gauss-Seidal method

UNIT - IV:

First-Order ODEs
Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.
Programs:
- Solving exact and non-exact equations
- Solving exponential growth/decay and Newton's law of cooling problems

UNIT - V:

Higher order linear differential equations with constant coefficients
Programs:
- Solving homogeneous ODEs
- Solving non-homogeneous ODEs

IV TEXT BOOKS:

1. MATLAB and its Applications in Engineering, Rajkumar Basal, Ashok Kumar Geo, Manoj Kumar Sharma, Pearson publication.
2. Kenneth A. Lambert, The fundamentals of Python: First Programs, 2011, Cengage Learnings.
3. Think Python First Edition, by Allen B. Downey, Orielly publishing.
4. Introduction to Python Programming, William Mitchell, Povel Solin, Martin Novak et al., NCLab Public Computing, 2012.
5. Introduction to Python Programming, ©Jacob Fredslund, 2007.

V REFERENCE BOOKS:

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, ©Dave Kuhlman, 2008.

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COURSE CONTENT

ANALOG AND DIGITAL COMMUNICATIONS LAB								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC407PC	**Engineering Sciences**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

1. Demonstrate the generation and detection of various analog and digital modulated signals.
2. Illustrate the sampling concept and interpret the generation and detection of various pulse analog modulated signals.
3. Obtain and analyze Multiplexing concepts.
4. Interpret the generation and detection of various pulse digital modulated signals
5. Evaluate various digital carrier modulation techniques experimentally.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Will be able to design and implement various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals
CO2:	Will be able to design and implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals
CO3:	Will be able to understand the concept of aliasing and different types of Sampling with various Sampling rates and duty Cycles by implementing practically
CO4:	Will be able to design and implement various Multiplexing Techniques and observe the waveforms of these modulated Signals practically
CO5:	Will be able to design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically

III LIST OF EXPEREMENTS:

Note:

- Minimum 12 experiments should be conducted.
- All these experiments are to be simulated first either using MATLAB, Commsim or any other simulation package and then to be realized in hardware.

1. Generate Amplitude modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
2. Generate Frequency modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
3. Generate modulated and demodulate DSB-SC Signal for different modulation indices and plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically.
4. Generate and demodulate SSB-SC modulated Signal (Phase Shift Method) for different modulation indices and plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case
5. Demonstrate the Frequency Division Multiplexing & De multiplexing practically by transmitting at least 4 different signals simultaneously with respect to time and recovering without distortion.
6. Demonstrate the Time Division Multiplexing & De multiplexing practically by transmitting at least 4 different signals simultaneously with respect to time and recovering without distortion.
7. Verify Sampling theorem for different sampling rates, Sampling types and Duty Cycles and Plot the sampled and reconstructed Signals. Write the conclusions, based on practical observations
8. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
9. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
10. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
11. Generate PCM Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations
12. Generate Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
13. Generate Adaptive Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations
14. Generate FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
15. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
16. Generate ASK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
17. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
18. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.

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COURSE CONTENT

ELECTRONIC CIRCUIT ANALYSIS LAB								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC408PC	**Engineering Sciences**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OVERVIEW:

The Electronic Circuit Analysis Laboratory is designed to provide hands-on experience in designing, building, and analyzing analog electronic circuits. It focuses on the practical implementation of amplifiers, oscillators, power amplifiers, multivibrators, and waveform generators using discrete components and simulation tools. The lab strengthens understanding of frequency response, gain, feedback, waveform shaping, and time base generation

II COURSE OBJECTIVES:

The students will try to learn:

1. Learn the concepts of multi stage amplifiers and high –frequency transistor model.
2. To familiarize the Concept of negative feedback in amplifiers.
3. To understand the principle of operation of LC, RC and Crystal Oscillators.
4. To learn the concept of Power Amplifiers.
5. To study the operation of various multivibrators and sweep circuits using transistors

III COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Design and analyze multistage and power amplifiers and evaluate their frequency response and efficiency
CO2:	Implement and examine feedback and oscillator circuits and validate theoretical conditions for sustained oscillations.
CO3:	Develop and interpret waveform generation circuits such as multivibrators and time base generators.
CO4:	Perform simulations to validate analog circuit performance using industry-standard software tools
CO5:	Correlate practical results with theoretical predictions and identify deviations due to real-world constraints.

IV LIST OF EXPEREMENTS:

A. **Hardware Experiments (7):**

Perform practical design, implementation, and waveform analysis of amplifiers, oscillators, power stages, and multivibrators to validate theoretical concepts and observe real-world circuit behavior.

1. Design and analyze a two-stage RC coupled amplifier to demonstrate gain enhancement and study coupling capacitance effects.
2. Design Hartley and Colpitts oscillators for a specified frequency and observe their output waveforms.
3. Design an RC phase shift oscillator and derive the practical gain condition for oscillations at a given frequency.
4. Design a transformer-coupled class A power amplifier, observe input/output waveforms, and calculate efficiency.
5. Design a class B power amplifier, analyze input/output waveforms, and evaluate harmonic distortion.
6. Design a bistable multivibrator, analyze commutating capacitor effects, and record transistor waveforms.
7. Design an astable multivibrator and observe transistor base and collector waveforms.

B. **Software Simulations (7):**

Use circuit simulation software to design, analyze, and verify the performance of feedback amplifiers, waveform generators, and power amplifier circuits through virtual experimentation and frequency response evaluation.

1. Simulate four feedback amplifier topologies and compare their frequency responses with and without feedback.
2. Simulate a monostable multivibrator and analyze its input/output waveforms.
3. Simulate a Schmitt trigger for gain values greater than and less than one and analyze response behavior.
4. Simulate a bootstrap time base generator using BJT and observe the output sweep waveform.
5. Simulate a Miller sweep circuit using BJT and observe the time base output waveform.
6. Simulate a complementary symmetry push-pull amplifier and verify elimination of crossover distortion.
7. Simulate a single tuned amplifier and determine the quality factor (Q) of its tuned circuit.

Software Requirements:

Simulation Tools: LTspice / Multisim / PSpice / Proteus / NI Multisim Live or equivalent

Operating System: Windows 10/11 or Linux (Ubuntu preferred)

Hardware Requirements:

1. Dual Power Supply (±15V, 0–30V)
2. Function Generator (up to 1 MHz)
3. CRO / DSO (Dual Channel, 20 MHz or more)
4. Digital Multimeters
5. Breadboards and Connecting Wires
6. BJTs: BC107, BC547, BC557, 2N2222, etc.
7. Resistors, Capacitors (Wide range of values)
8. Transformers (for power amplifiers)
9. Inductors, Crystals (1 MHz, 4 MHz, etc.)
10. Heat sinks, transistors for power stages (e.g., TIP41, TIP42 etc.)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC-Autonomous)

Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097

COURSE CONTENT

LINEAR AND DIGITAL IC APPLICATIONS LAB								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC409PC	**Engineering Sciences**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

1. Implement different circuits and verify circuit concepts.
2. Study the concepts of multi vibrators and filters.
3. Verify the operations of the 555 timers and PLLs and their applications.
4. Design and verify combinational circuits.
5. Design and verify sequential circuits.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Design and implementation of various analog circuits using 741 ICs
CO2:	Design and implementation of various Multivibrators using 555 timer
CO3:	Design and implement ADC, DAC and voltage regulators
CO4:	Designing and implement various combinational circuts using ICs
CO5:	Designing and implement various sequential circuts using ICs

III LIST OF EXPEREMENTS:

Note:

- Minimum 12experiments should be conducted.
- Verify the functionality of the IC in the given application.

List of Experiments:

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op-Amp and draw the comparison results of V_{in} with V_{ref}.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHz and find the roll off of it.
6. Design a Circuit using IC741 to generate sine / square / triangular wave with period of 1 KHz and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
11. Design Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type / counter type / successive approximation ADC and find its efficiency.
14. Design a Gray code converter and verify its truth table.
15. Design an even priority encoder using IC74xx and verify its truth table.
16. Design a 8x1multiplexer using digital ICs.
17. Design a 4-bit Adder / Subtractor using digital ICs and Add / Sub the following bits.

    (i) 1010 (ii) 0101 (iii) 1011

    0100 0010 1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design a Up/downcounterusingIC74163anddrawread/write waveforms.
20. Design a Universal shift register using IC74194 / 195and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read /write operation.
22. Design a 8x3 encoder / 3x8 decoder and verify its truth table.

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COURSE CONTENT

WEB AND MOBILE APPLICATIONS								
B.Tech. II Year II Semester: ECE					**Regulations: R25**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
25EC410SD	**Foundation**	0	0	2	1	40	60	100
Contact Classes: 0	**Tutorial Classes: 0**	**Practical Classes: 30**				**Total Classes: 30**		
Prerequisite:								

I COURSE OBJECTIVES:

The students will try to learn:

1.To introduce students to the **structure and working of web applications** using basic web technologies.

2. To provide hands-on practice in **developing Python-based web applications** using simple frameworks.

3. To help students understand **how data is managed** in web applications through database connectivity.

4.To expose students to the **basics of mobile application development** using Python tools.

5.To encourage students to **apply programming skills** to develop small, real-world web and mobile applications.

II COURSE OUTCOMES:

At the end of the course students should be able to:	
CO1:	Design and develop **basic static web pages** using HTML and CSS.
CO2:	Create **simple dynamic web pages** using JavaScript for form validation and user input handling.
CO3:	Develop **Python-based web applications** using Flask and HTML templates
CO4:	Implement **database connectivity** in web applications using SQLite/MySQL to perform basic data operations.
CO5:	Build **simple mobile or mini web applications** using Kivy or Flask by integrating frontend, backend, and database components.

III LIST OF EXPEREMENTS:

Note: Software Used: Python 3, VS Code, Flask, Kivy, SQLite/MySQL, Firefox

Week–1
Create a basic HTML web page to display simple information such as name, roll number, and department.

Week–2
Apply basic CSS to the HTML page to modify background color, text color, font size, and text alignment.

Week–3
Create a simple HTML form and use JavaScript to validate empty input fields.

Week–4
Develop a simple Flask web application to display a message or student details on a web page.

Week–5
Use Flask and HTML templates to display values passed from a Python program to a web page.

Week–6
Create a simple Flask application with SQLite database to insert and display student records.

Week–7
Develop a basic login system using Flask with username and password validation.

Week–8
Develop a simple mobile application using Kivy, such as a calculator or student information form.

Week–9
Enhance the Flask application by implementing session management to maintain user login state and provide a logout option.

Week–10
Develop and demonstrate a mini application using Flask or Kivy, integrating basic frontend, backend, and database concepts