

## **DEPARTMENT OF HUMANITIES & SCIENCES**

### **ACADEMIC REGULATIONS & SYLLABI (R-22)**

#### **B.Tech I Year**

#### **Electronics & Communication Engineering**

**w.e.f. the Academic Year 2022-2023**



**Vidya Jyothi Institute of Technology**

**(An Autonomous Institution)**

**(Accredited by NAAC A+ Approved by AICTE New Delhi & Permanently Affiliated to JNTUH)**

**Aziz Nagar Gate, C.B. Post, Hyderabad-500 075**

**DEPARTMENT OF HUMANITIES & SCIENCES**
**B. TECH I YEAR COURSE STRUCTURE 2022-23**
**(Electronics & Communication Engineering)**
**Semester – I**

S. No	Course Code	Course Title	L	T	P	Credits
1	A221001	Mathematics-I(Linear Algebra& Calculus)	3	1	0	4.0
2	A221002	Applied Physics	3	1	0	4.0
3	A221081	Applied Physics Lab	0	0	3	1.5
4	A221501	C-Programming for Engineers	3	0	0	3.0
5	A221581	C-Programming for Engineers Lab	0	0	2	1.0
6	A221003	English for Skill Enhancement	2	0	0	2.0
7	A221082	English Language & Communication Skills Lab	0	0	2	1.0
8	A221401	Elements of Electronics & Communication Engineering	0	0	2	1.0
9	A221381	Engineering Workshop	0	1	3	2.5
10		Induction Programme				
Total			11	3	12	20

**Semester – II**

S. No	Course Code	Course Title	L	T	P	Credits
1	A222005	Mathematics–II( Ordinary Differential Equations & Vector Calculus)	3	1	0	4.0
2	A222006	Engineering Chemistry	3	1	0	4.0
3	A222084	Engineering Chemistry Lab	0	0	2	1.0
4	A222204	Basic Electrical Engineering	2	0	0	2.0
5	A222283	Basic Electrical Engineering Lab	0	0	2	1.0
6	A222402	Electronic Devices & Circuits	2	0	0	2.0
7	A222303	Engineering Graphics & Modelling	1	0	4	3.0
8	A222583	Python Programming Lab	0	2	2	3.0
Total			11	4	10	20

## MATHEMATICS-I (LINEAR ALGEBRA AND CALCULUS)

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A221001</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>40</b>	<b>60</b>	<b>100</b>

**Pre-requisites: Mathematical Knowledge at pre-university level**

### Course Objectives:

To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

### Course Outcomes:

After learning the contents of this course, the students must able to:

1. Write the matrix representation of system of linear equations and identify the consistency of the system of equations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extrima of functions of two variables with/ without constraints.

## Syllabus

### UNIT-I Matrices and Linear System of Equations :

Introduction of Matrices, Rank - Echelon form, Normal form. Solution of Linear Systems – Gauss Elimination and LU Decomposition methods.

### UNIT-II: Eigen Values and Eigen Vectors:

Eigen values, Eigen vectors – properties, Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonalization of matrix- Quadratic forms: Nature, Index and Signature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

**UNIT-III: Sequences & Series:**

Basic definitions of Sequences and series, Convergence and divergence, Ratio test, Comparison test, Cauchy's root test, Raabe's test, Integral test, Absolute and conditional convergence.

**UNIT-IV: Improper Integrals and Mean Value Theorems:**

**Improper Integrals:** Gamma and Beta Functions-Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

**Mean Value Theorems:** Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (Taylor's and MacLaurin's Series all theorems without proof) – Geometrical interpretation of Mean value theorems.

**UNIT-V: Functions of several variables:**

**Partial Differentiation:** Total derivative, Functional dependence, Jacobian Determinant- Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

**Textbooks:**

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar Narosa Publications.

**Reference Books:**

1. Calculus and Analytic geometry by G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics by Erwin Kreyszig, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2<sup>nd</sup> Edition) Michael D. Greenberg

## APPLIED PHYSICS

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A221002</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>40</b>	<b>60</b>	<b>100</b>

### B.Tech I Year I Semester

#### Course Outcomes:

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

1. Understand various optical phenomena of light
2. Apply the basic principles of quantum mechanics to classify solids based on the band theory
3. Elucidate the characteristics of semiconductors and semiconductor devices
4. Apply the knowledge of nanotechnology for societal applications
5. Explain the working principle of lasers and optical fibers

#### Unit – I Wave Optics

Principle of superposition, coherence. Interference - Interference in thin films by reflection, Newton's rings. Diffraction – Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to single slit, Plane diffraction grating, Resolving power of grating (qualitative treatment). Polarization – Polarization of light waves, Plane of vibration, Plane of polarization, Double refraction, Nicol's Prism, Applications of polarization.

#### UNIT-II Introduction to Quantum Physics and Band theory of solids

Introduction to quantum physics: Planck's Law (qualitative treatment), wave-particle duality, de-Broglie hypothesis of matter waves, properties of matter waves, time independent Schrodinger equation, Born interpretation of wave function, particle in one dimensional potential box, Fermi-Dirac distribution.

Classical free electron Theory (Qualitative treatment)- merits and demerits, Bloch theorem, Kronig-Penny model (qualitative treatment), E-k diagram, effective mass of electron, Energy bands in solids, classification of materials into metals, semiconductors and insulators.

#### UNIT-III Semiconductors and Semiconductor devices

Intrinsic and extrinsic semiconductors- energy band diagram and position of fermi level (qualitative treatment).

Direct and indirect band-gap semiconductors, Formation of PN junction, energy level diagram of PN junction, I-V characteristics of PN junction diode; construction, working and characteristics of Photo diode, solar cell and light emitting diode, Hall effect and its applications

#### UNIT-IV Nanotechnology

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods-top-down fabrication: Ball milling, physical vapor deposition (PVD), chemical vapor deposition (CVD), characterization techniques – basic principles of XRD, SEM, TEM; applications of nanomaterials.

#### UNIT-V Lasers and Fiber Optics

Introduction to interaction of radiation with matter: Absorption, spontaneous emission and stimulated emission, Einstein coefficients and their relations, characteristics of a laser, population inversion, important

components of a laser: active medium, pumping source, optical resonator. Construction and working of Ruby laser, He-Ne laser and semiconductor laser, applications of lasers.

Introduction to optical fibers, total internal reflection, construction of optical fiber, acceptance angle and numerical aperture, step and graded index fibers, block diagram of optical fiber communication system, applications of optical fibers.

**Text books:**

1. A Text book of Engineering Physics by P K Palanisamy: Sciotech publication.
2. Engineering Physics by V Rajendran, McGraw Hill Education.

**Reference books:**

1. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2<sup>nd</sup> dition,2022.
2. Essentials of Nanoscience & Nanotechnology by Narsimha Reddy Katta, Typical Creatives NANO DIGEST, 1<sup>st</sup> Edition, 2021.
3. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S. Chand Publications.

### APPLIED PHYSICS LAB

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
A221081	L	T	P	C	CIE	SEE	Total
	0	0	3	1.5	40	60	100

### B. Tech I Year I Semester

#### Course Outcomes:

At the end of the course, the student will be able to

1. Apply optical phenomena to characterize optical sources and components.
2. Characterize semiconductors and semiconductor devices.
3. Study transient response of RC circuit and resonance mechanisms in mechanical and electrical systems.
4. Collect data and evaluate the outcomes of an experiment quantitatively and qualitatively.
5. Carry out experimental data analysis.

#### LIST OF EXPERIMENTS

1. Newton's rings: Determination of the radius of curvature of a given plano-convex lens by forming Newton's rings.
  2. Diffraction grating: Determination of wavelength of a given monochromatic source using a plane diffraction grating.
  3. Dispersive power: Determination of dispersive power of given prism.
  4. Single Slit Diffraction using Laser- Determination of wavelength of given Laser.
  5. Energy gap of P-N junction diode: Determination of the energy gap of a semiconductor diode.
  6. Light emitting diode: Study of V-I and P-I characteristics of a given light emitting diode.
  7. Photo diode: Study of V-I characteristics of photo diode at different intensities.
  8. Solar cell: Study of V-I characteristics of solar cell.
  9. LCR Circuit: Determination of the resonance frequency of forced electrical oscillator in series and parallel.
  10. RC- Circuit: Determination of the time constant of RC-circuit.
  11. Optical fiber: a) Determination of the acceptance angle and numerical aperture of optical fiber.  
b) Estimation of attenuation in optical fiber
  12. Method of least squares-Torsional pendulum.
- Note: Any 10 experiments are to be performed.

#### Reference books:

1. Engineering Physics Theory and Practical, C. K. Pandey, A. K. Katiyar.
2. Engineering Physics Lab Manual, C. V. Madhusudan Rao.

## C-PROGRAMMING FOR ENGINEERS

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
A221501	L	T	P	C	CIE	SEE	Total
	3	0	0	3	40	60	100

### B.Tech. I Year I Semester

#### Course Outcomes:

At the end of this course, the student would be able to

1. Design Algorithms and Flowcharts for real world applications.
2. Know various operators and decision statements for Program development.
3. Design programs involving iteration statements and code reusability using Functions.
4. Develop programs using arrays and identify various string handling functions.
5. Analyze various searching and sorting techniques.

#### UNIT - I:

**Introduction:** Introduction to Computers, Number Systems & Conversions, Algorithms, Flowcharts.

**Overview of C Language:** Introduction, Salient Features of C Language, Structure of a “C” Program.

**C Language Preliminaries:** Keywords and Identifiers, Constants, Variables, Data Types, and Input / Output Statements with suitable illustrative “C” Programs.

#### UNIT - II:

**Operators:** Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative “C” Programs.

**Conditional/Decision Statements:** if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative “C” Programs.

#### UNIT - III:

**Loop Control Statements:** while, do-while and for with suitable illustrative “C” Programs, break, continue.

**Pointers:** Defining pointers, increment & decrement operations, Pointer to Pointers.

**Functions:** Introduction to Functions, benefits of functions, types of functions, Function calls, return Statement, Parameter Passing mechanism: Call-by-Value, Call-by-reference Recursion, Storage Classes.

#### UNIT - IV:

**Arrays:** Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions, Pointers and Arrays.

**Strings:** Introduction to Strings, String I/O, String Manipulation Functions (strlen( ), strcmp( ), strcat( ), strcpy( ), strcmp( ), toupper( ), tolower( )).

#### UNIT - V:

**Structures:** Definition and Initialization of Structures, Accessing structure members, Unions, typedef.

**Searching and Sorting:** Linear Search, Binary Search, Bubble Sort, Insertion Sort.

**Data Structures:** Introduction, Stacks, Queues.

**TEXT BOOKS:**

1. B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016.
2. Ashok N. Kamthane, “C and Data Structures”, Pearson Education. 2010.

**REFERENCE BOOKS:**

- 1.M.T.Somashekara, “Problem Solving Using C”, PHI, 2<sup>nd</sup> Edition 2009.
2. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press .
3. PradipDey and Manas Ghosh, "Programming in C 2/e", Oxford University Press, 2nd Edition 2011.
4. Rajaraman V., "The Fundamentals of Computers", 4th Edition,Prentice Hall of India, 2006.
5. R S Bichker, "Programming in C", University Press, 2012.

### C-PROGRAMMING FOR ENGINEERS LAB

Department of Humanities & Sciences					I B.Tech I Semester		
Course Code	Hours/Week			Credits	Marks		
<b>A221581</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1.0</b>	<b>40</b>	<b>60</b>	<b>100</b>

#### B.Tech. I Year I Semester

##### Course Outcomes:

At the end of this course, the student would be able to

1. Apply the specification of syntax rules for numerical constants, variables and data types.
2. Know the usage of various operators and design programs on decision Statements.
3. Design programs on loop control statements, pointers and code reusability using functions.
4. Develop programs on array and strings.
5. Implement programs on structures and various searching and sorting techniques.

##### Week 1

Ubuntu and Linux Commands.

##### Week 2

Designing of flowcharts and algorithms

1. Areas of Polygons.
2. Calculation of Simple and Compound Interest.
3. Swapping of Two numbers with and without temporary variable.
4. Checking whether a number is even or odd.
5. Sum of first 'n' natural numbers.
6. Checking a number whether it is divisible by any given number.
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.
9. Program to find the roots of quadratic equation.

##### Week 3

Programs on operators.(min 9 programs)

Programs on precedence and Associativity & Type conversions.

Programs on Conditional Statements or Decision Statements.(12)

**Week 4,5,6**

Programs on Loop Control Statements.(12)

Programs on Pointers, pointer arithmetic, pointer to pointer (6).

Programs on Functions, Recursion& Storage classes.(8)

**Week 7,8**

Programs on One Dimensional Arrays. (3)

Programs on Two Dimensional Arrays. (2)

Programs on Arrays and Functions, Pointer to Array.

Programs on Strings with string built-in or manipulation Functions.(8)

**Week 9,10,11**

Programs on Accessing Structures.(4)

Programs on Unions, typedef(4)

Implementation of Linear Search and Binary Search.

Implementation of Bubble Sort and Insertion Sort

## ENGLISH FOR SKILL ENHANCEMENT

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
A221003	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

### B. Tech I Year I Semester

#### Course Objectives:

This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

#### Course Outcomes:

Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for oral and written communication.
3. Demonstrate understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages through effective reading strategies.
5. Construct paragraphs, letters, essays, abstracts, précis and reports in various contexts thereby improving proficiency in writing modules of English.

### UNIT - I

Chapter entitled '*Toasted English*' by R.K.Narayan from "*English: Language, Context and Culture*" published by Orient Black Swan, Hyderabad.

**Vocabulary:** The Concept of Word Formation - The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance - Techniques for Effective Reading.

**Writing:** Sentence Structures - Use of Phrases and Clauses in Sentences - Importance of Proper Punctuation - Techniques for Writing precisely – Paragraph Writing -Types, Structures and Features of a Paragraph - Creating Coherence - Organizing Principles of Paragraphs in Documents.

### UNIT - II

Chapter entitled '*Appro JRD*' by Sudha Murthy from "*English: Language, Context and Culture*" published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Words Often Misspelt - Homophones, Homonyms and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-Verb Agreement.

**Reading:** Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**Writing:** Nature and Style of Writing - Defining/Describing People, Objects, Places and Events – Classifying - Providing Examples or Evidence.

### UNIT - III

Chapter entitled ‘Lessons from Online Learning’ by F. Haider Alvi, Deborah Hurst et al from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

**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 – Intensive Reading and Extensive Reading – Exercises for Practice.

**Writing:** Format of a Formal Letter - Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

### UNIT - IV

Chapter entitled ‘Art and Literature’ by Abdul Kalam from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

**Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion – Précis Writing.

### UNIT - V

Chapter entitled ‘Go, Kiss the World’ by Subroto Bagchi from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Technical Vocabulary and their Usage

**Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous units*)

**Reading:** Reading Comprehension-Exercises for Practice

**Writing:** Technical Reports - Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

### TEXTBOOK:

1. “English: Language, Context and Culture” by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

### REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
3. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
4. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

## ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A221082</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>40</b>	<b>60</b>	<b>100</b>

### B. Tech I Year I Semester

#### Course Objectives:

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact of dialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews

#### Course Outcomes:

Students will be able to:

1. Reproduce speech sounds and improve language
2. Develop accent and pronunciation in various situations
3. Understand variants in pronunciation by differentiating between British and American accents
4. Identify the diverse purposes of listening and speaking
5. Exhibit critical thinking, problem-solving and decision-making skills through Group Discussions

#### Exercise I

##### CALL Lab:

*Understand:* Listening Skill- its importance-Purpose-Process-Types-Barriers-Effective Listening.

*Practice:* Introduction to Phonetics- Speech Sounds- Vowels and Consonants- Minimal Pairs - Consonant Clusters - Past Tense Marker and Plural Marker - *Testing Exercises*

##### ICS Lab:

*Understand:* Spoken vs. Written language - Formal and Informal English.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

## Exercise II

### CALL Lab:

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - *Testing Exercises*

### ICS Lab:

*Understand:* Features of Good Conversation – Strategies for Effective Communication.

*Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

## Exercise III

### CALL Lab:

*Understand:* Errors in Pronunciation-Neutralizing Mother Tongue Interference (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation - *Testing Exercises*

### ICS Lab:

*Understand:* Descriptions – Narrations - Giving Directions and Guidelines – Blog Writing

*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

## Exercise IV

### CALL Lab:

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests - *Testing Exercises*

### ICS Lab:

*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication - Presentation Skills.

*Practice:* Making a Short Speech – Extempore - Making a Presentation.

## Exercise V

### CALL Lab:

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests -*Testing Exercises*

### ICS Lab:

*Understand:* Group Discussion

*Practice:* Group Discussion

**REFERENCE BOOKS:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook*. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook*. Cambridge University Press
3. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities*. Orient Black Swan Pvt. Ltd.

## ELEMENTS OF ELECTRONICS & COMMUNICATION ENGINEERING

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A221401</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>50</b>	-	<b>50</b>

### B.Tech. I Year I Sem.

#### Course Outcomes:

1. Identify the different components used for electronics applications
2. Measure different parameters using various measuring instruments
3. Distinguish various signal used for analog and digital communications
4. Identify the Pin Configuration of IC's.
5. Acquire Knowledge in various software's of ECE.

#### LIST OF EXPERIMENTS

1. Understanding the usage of Breadboard.
2. Identify the different passive and active components
3. Color code of resistors, finding the types and values of capacitors
4. Measure the voltage and current using voltmeter and ammeter
5. Measure the voltage, current with Multimeter and study the other measurements using Multimeter.
6. Study the CRO and measure the frequency and phase of given signal
7. Draw the various Lissajous figures using CRO
8. Study the function generator for various signal generations
9. Study of Spectrum analyzer and measure the spectrum
10. Operate Regulated power supply for different supply voltages
11. Study the various gates module and write down the truth table of them
12. Identify various Digital and Analog ICs
13. Observe the various types of modulated signals.
14. Know the available soft wares for Electronics and communication applications

## ENGINEERING WORKSHOP

Department of Humanities & Sciences				I B.Tech I Semester			
Course Code	Hours/Week			Credits	Marks		
A221381	L	T	P	C	CIE	SEE	Total
	0	1	3	2.5	40	60	100

### B. Tech. I Year I Semester

#### Course Outcomes:

At the end of the course, the student will be able to

1. Understanding the tools and methods of using to fabricate engineering Components.
2. Applying the measuring techniques to verify the dimensional accuracy.
3. Evaluating various methods and trades of workshop in the component building.

#### 1. TRADES FOR EXERCISES:

At least two exercises from each trade:

1. Carpentry – T-Lap Joint, Dovetail Joint & Tenon Joint.
2. Fitting – V-Fit, Step Cutting & Flat Filling.
3. Tin-Smithy – Open Scoop, Rectangular Tray & Conical Funnel.
4. Foundry – Preparation of Green Sand Mould using Single Piece and Split Pattern.
5. Welding Practice – Arc Welding – Lap Joint & Butt Joint.
6. House-wiring – Parallel Connection, Series Connection & Two-way Switch.

#### 2. TRADES FOR DEMONSTRATION & EXPOSURE

Plumbing, Machine Shop, Power tools in construction and Wood Working

#### TEXT BOOKS:

1. Manufacturing Engineering and Technology, Kalpakjian S. and Steven S. Schmid, 4<sup>th</sup> edition, Pearson Education India Edition, 2002.
2. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

#### REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
2. Workshop Manual / Venkat Reddy/ BSP

## MATHEMATICS II (ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS)

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
A222005	L	T	P	C	CIE	SEE	Total
	3	1	0	4	40	60	100

### B.Tech I Year II Semester

**Pre-requisites: Mathematical Knowledge at pre-university level**

#### Course Objectives:

To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions

The basic properties of vector valued functions and their applications to line, surface and volume integrals

#### Course Outcomes:

After learning the contents of this course the students must be able to:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real-world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real-world problems.
3. Find the Laplace Transform of various functions and apply to find the solutions of differential equations.
4. Evaluate the multiple integrals and identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

#### UNIT-I:

##### First order Ordinary Differential Equations and their Applications:

Introduction to ODE, Exact, Linear and Bernoulli, Applications of ODE: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

#### UNIT-II:

##### Higher Order Linear Differential Equations:

Linear differential equations of second and higher order with constant coefficients, RHS term of the type  $f(x) = e^{ax}, \sin ax, \cos ax$  and  $x^k, e^{ax}V(x), x^kV(x)$ . Method of variation of parameters, Equations reducible to

Linear ODE with constant coefficients: Cauchy-Euler Equation and Legendre's Equations.

Applications: Electric Circuits

**UNIT-III:****Laplace transforms:**

Laplace transform of standard functions – Inverse transform – first shifting Theorem, transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function – Convolution theorem – Periodic function - Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

**UNIT-IV:****Multiple Integrals & Vector Differentiation:**

Multiple integrals - double and triple integrals – change of order of integration (Only Cartesian form)-change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Gradient- Divergence- Curl and their related properties - Potential function - Laplacian and second order operators.

**UNIT-V:****Vector Integration:**

Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements & their Verifications).

**Textbooks:**

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain &Iyengar, Narosa Publications.

**Reference Books:**

1. Calculus and Analytic geometry by G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics by Erwin Kreyszig, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2<sup>nd</sup> Edition) by Michael D. Greenberg

## ENGINEERING CHEMISTRY

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A222006</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>40</b>	<b>60</b>	<b>100</b>

### B.Tech I Year II Semester

#### Course Objectives :

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion - it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

#### Course Outcomes:

The students will able to

1. understand the basic properties of water and its usage in domestic and industrial purposes.
2. acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
3. learn the fundamentals and general properties of polymers and other engineering materials.
4. acquire knowledge of various energy sources.
5. apply the knowledge of engineering materials in daily life.

#### UNIT - I: Water and its treatment: (10)

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F<sup>-</sup> ion by ion- selective electrode method.

Boiler Troubles - Introduction. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange process. Desalination of Brackish water - Reverse osmosis.

#### UNIT – II Battery Chemistry & Corrosion: (11)

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of Zn-air and Lithium-ion battery. Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

**Corrosion:** Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode & impressed current methods and Electroless plating.

**UNIT - III: Polymeric materials: (9)**

Definition – Classification of polymers with examples – Types of polymerizations – addition and condensation polymerization with examples – Nylon 6:6, Terylene **Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC, Bakelite and Teflon.

**Rubbers:** Natural rubber and its vulcanization.

Synthetic Rubbers- Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

**Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

**Biodegradable polymers:** Concept and advantages – Poly lactic acid and poly vinyl alcohol and their applications.

**UNIT - IV: Energy Sources: (9)**

Introduction, Calorific value of fuel – HCV, LCV- Dulong's formula, Numerical problems. Classification- Solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Trans esterification and advantages.

**UNIT - V: Engineering Materials: (9)**

**Cement:** Portland cement, its composition, setting and hardening.

**Smart materials and their engineering applications**

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Poly acryl amides and Poly vinyl amides

**Lubricants:** Classification of lubricants with examples-characteristics of a good lubricant - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

**TEXT BOOKS:**

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpat Rai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.

**REFERENCE BOOKS:**

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

## ENGINEERING CHEMISTRY LABORATORY

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
A222084	L	T	P	C	CIE	SEE	Total
	0	0	2	1	40	60	100

### B.Tech I Year II Semester

#### Course Objectives:

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

1. Estimation of hardness and chloride content of water to check its suitability for drinking purpose.
2. To perform estimation of acids and bases using conductometry, potentiometry and pH metry methods.
3. To prepare polymers such as Thiokol rubber and Nylon-6 in the laboratory.
4. Skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

#### Course Outcomes:

The experiments will make the student gain skills on:

1. Determination of parameters like hardness and Chloride content of water.
2. Determination of rate of corrosion of mild steel in various conditions.
3. To perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
4. To prepare polymers like Thiokol rubber and Nylon-6.
5. Estimation of Saponification value, Viscosity and Surface tension of lubricant oils.

#### Choice of 8-10 Experiments from the following:

1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
2. **Corrosion:** Determination of rate of corrosion of mild steel in various conditions.
3. **Conductometry:**
  - a. 1. Estimation of the concentration of an acid by Conductometry.
  - b. 2. Estimation of the concentration of Mixture of acids by conductometry
4. **Potentiometry:**
  - a. Estimation of the Concentration of an acid by potentiometry
  - b. Estimation of the amount of Fe<sup>+2</sup> by Potentiometry
5. **pH Metry:** Determination of an acid concentration using pH meter.
6. **Argentometry:** Estimation of Chloride content of water by argentometry
7. **Preparations:**
  - a. Preparation of Thiokol rubber.
  - b. Preparation Nylon – 6.

#### I. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
3. Estimation of Surface tension of lubricant oil using Stalagmometer.

### 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
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publication

## BASIC ELECTRICAL ENGINEERING

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
A222204	L	T	P	C	CIE	SEE	Total
	2	0	0	2	40	60	100

### B.Tech I Year II Semester

#### Course Outcomes:

At the end of the course, students will be the able to

CO1. Understand basic principles of electrical elements.

CO2. Apply the concepts of AC circuits to various elements and combinations.

CO3. Examine principle and tests of transformer.

CO4. Contrast the working of DC machines and induction motors.

CO5. Assess working principle of AC generator and electrical installations.

#### UNIT- I

##### Introduction to Electrical Engineering and DC Circuits:

Basic definitions, Ohm's law, types of elements, types of sources, Kirchhoff's laws, resistive networks-series, parallel circuits, delta- star and star- delta transformation, Network theorems- Superposition, Thevenin's - simple problems.

#### UNIT- II

**AC Circuits:** Representation of sinusoidal waveforms, peak, rms and average values. Phase representation of alternating quantities, analysis of AC circuits with single basic network element (R, L, C), single phase series circuits, concept of resonance, three-phase balanced circuits-voltage and current relations in star and delta connections.

#### UNIT- III

**Transformers:** Constructional details, principle of operation, ideal and practical single-phase transformer, losses in transformer, OC-SC tests, regulation and efficiency - simple problems.

#### UNIT- IV

##### Dc Machines And Induction Motors

**DC Machines:** Construction, principle and operation of DC motor, voltage- torque equations - simple problems.

**Three Phase Induction Motor:** Construction, principle and working of three phase induction motor, torque-slip characteristics-simple problems.

Single phase induction motor- Working principle.

#### UNIT- V

##### Ac Generator & Electrical Installation

**Ac Generator:** Construction, principle of operation of synchronous generator, EMF equation.

**Electrical Installation:** Fuse, circuit breakers, difference between fuse and circuit breaker, Types of batteries, battery backup.

#### TEXT BOOKS:

1. Basic Electrical Engineering - by T.K. Nagasarkar and M.S. Sukhija, Oxford University press.
2. Basic Electrical Engineering-by M.S. Naidu and S. Kamakshiah-TMH.

**REFERENCE BOOKS:**

1. Network Analysis by Sudhakar & Shyam Mohan.
2. Basic Electrical Engineering-by S.K. Bhattacharya, Pearson Publications.
3. Basic Electrical Engineering by K. Uma Rao and A. Jayalakshmi, IK Publications.

## BASIC ELECTRICAL ENGINEERING LABORATORY

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A222283</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>40</b>	<b>60</b>	<b>100</b>

### B.Tech I Year II Semester

**Pre requisite: Basic Electrical Engineering**

#### Course Outcomes:

At the end of the course, students will be the able to

- CO1. Understand basic electrical laws.
- CO2. Analyze the response of different types of electrical circuits to different excitations.
- CO3. Apply electric laws and find out performance of various electrical machines.
- CO4. Assess the losses in electrical machines.
- CO5. Evaluate the performance of Electrical Circuits and Electrical Machines.

#### List of experiments/demonstrations:

**Any 5 experiments from Part-A and Part-B should be conducted (Total 10 Experiments)**

#### Part-A

1. Verification of Ohms law.
2. Verification of KVL and KCL .
3. Verification of Thevenin's Theorem.
4. Verification of Superposition Theorem.
5. Transient Response of Series R- L and R - C circuits using DC excitation .
6. Determination and Verification of Impedance and Current of RL and RC series circuits .

#### Part-B

1. Transient Response of R-L-C Series circuit using DC excitation .
2. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
3. OC & SC Test on Single phase transformer.
4. Brake test on DC shunt motor.
5. Brake test on Three Phase Squirrel cage induction motor.
6. OCC of Three phase alternator.

#### REFERENCE BOOKS:

1. Sudhakar and Shyam Mohan, "Circuits and Networks" Tata Mc Graw Hill Companies.
2. P.S.Bimbira, "Electrical Machines", Khanna Publishers.

## ELECTRONIC DEVICES & CIRCUITS

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
A222402	L	T	P	C	CIE	SEE	Total
		2	0	0	2	40	60

### B.Tech I Year II Semester

#### Course Outcomes:

Upon completion of the Course, the students will be able to:

1. Acquire the knowledge of various electronic devices and their use on real life.
2. Know the applications of various devices.
3. Acquire the knowledge about the Bipolar Junction Transistor.
4. Acquire the knowledge about the Field Effect Transistor.
5. Acquire the knowledge about the role of special purpose devices and their applications.

#### UNIT- I

**Diodes:** Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

#### UNIT- II

**Diode Applications:** Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

#### UNIT- III

**Bipolar Junction Transistor (BJT):** Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

#### UNIT- IV

**Field Effect Transistor (FET):** JFET- Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSFET as a capacitor.

#### UNIT- V

**Special Purpose Devices:** Zener Diode - Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

#### TEXT BOOKS:

1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11<sup>th</sup> Edition, 2009, Pearson.

#### REFERENCE BOOKS:

1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup>Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles and Applications, Cambridge, 2018.

## ENGINEERING GRAPHICS & MODELING

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
A222303	L	T	P	C	CIE	SEE	Total
	1	0	4	3	40	60	100

### B.Tech I Year II Semester

#### Course Outcomes:

1. Comprehend the concepts of engineering drawing and CAD software.
2. Conceptualize and draw the projections of points and straight lines.
3. Visualize and project different views of a planes and solids.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.
5. Generate isometric and corresponding orthographic views of any given component.

#### UNIT- I:

**Introduction To Engineering Drawing:** Principles of engineering graphics and their significance, usage of drawing instruments, conic sections, including the rectangular hyperbola– general method only. Cycloid, Epicycloid, Hypocycloid. Scales – plain & diagonal only.

**INTRODUCTION TO CAD:** Introduction to CAD software and its importance, standard toolbar/menus and navigation tools used in the software.

#### UNIT- II:

**Principles Of Orthographic Projections:** Conventions. Projections of points.

**Projections Of Lines:** (first angle projection) inclined to both planes (traces and midpoint problem to be excluded).

**Implementation Of CAD:** Drawing orthographic projections of points and lines using a CAD package.

#### UNIT – III:

**Projections Of The Planes:** Projections of regular planes inclined to both the planes.

**Projections Of Solids:** Projections of regular solids inclined to both the planes (prisms, pyramids, cones and cylinders, Change of position method only).

**Implementation In CAD:** Drawing orthographic projection of planes and regular solids using a CAD package.

#### UNIT- IV:

**Sections And Sectional Views Of Right Angular Solids:** Prism, Cylinder, Pyramid, Cone.

**Development Of Surfaces Of Right Regular Solids:** Prism, Pyramid, Cylinder and Cone.

**Implementation In CAD:** Drawing sectional views of solids and the development of right regular solids using a CAD package.

#### UNIT-V:

**Principles Of Isometric Projection:** Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids. Conversion of orthographic views to isometric views.

**Orthographic Projections:** conversion of isometric views to orthographic views.

**Implementation In Cad:** Drawing isometric views from giving orthographic views and vice-versa using a CAD package.

### **TEXT BOOKS:**

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., Charotar Publishing House.

### **REFERENCE BOOKS:**

1. Text book on Engineering Drawing, Narayana, K.L. & P. Kanniah, Scitech Publishers.
2. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C, Pearson Education.
3. [http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac\\_2013\\_users\\_guide.pdf](http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf)

## PYTHON PROGRAMMING LAB

Department of Humanities & Sciences				I B.Tech II Semester			
Course Code	Hours/Week			Credits	Marks		
<b>A222583</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	CIE	SEE	Total
	<b>0</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>

### B. Tech I Year II Semester

#### Course Outcomes:

After completion of the course, the student should be able to

- Develop the application specific codes using python.
- Understand Strings, Lists, Tuples and Dictionaries in Python
- Implement programs using modular approach, file I/O, Python standard library

#### Week -1 (Installation & Simple Applications)

1. i) Use a web browser to go to the Python website <http://python.org>. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.  
ii) Start the Python interpreter and type `help()` to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.

#### Week - 2: (Mathematical Expressions & I/O Operations)

1. i) Write a program to calculate compound interest when principal, rate and number of periods are given.  
ii) Given coordinates (x1, y1), (x2, y2), find the distance between these two points.
2. Read name, address, email and phone number of a person through keyboard and print the details.

#### Week – 3 (Conditional statements)

1. Write a Program to find the given number is even or odd.
2. Write a program to find the maximum of three numbers (use 'if-elif-else' ladder).

#### Week – 4 (Loop Statements)

1. Write a program to Print the Fibonacci sequence using while loop.
2. Write a program to Print the below triangle using for loop:

```

5
4 4
3 3 3
2 2 2 2
1 1 1 1 1

```

3. Write a program to print all prime numbers in a given interval (using break statement).

#### Week – 5 (List, Tuple, Dictionary)

1. i) Write a program to illustrate operations of List & Tuple  
ii) Write a program to find common values between two lists.
2. Write a program to perform addition of two matrices.
3. Write a program to read dictionary values from the user and find an element using given key.

#### Week – 6 (Functions & Modules)

1. Write a function called `is_sorted` that takes a list as a parameter and return True if the list is sorted in ascending order and False otherwise.

2. Write a function called GCD that takes parameters **a** and **b** and return their greatest common divisor.
3. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

### Week –7(Strings)

1. Write a program to add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
2. Write a program to remove the given word in all the places in a string?
3. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

### Week–8 (Classes & objects)

1. Write a program to add two complex numbers using classes and objects
2. Write a function called draw\_rectangle that takes a Canvas and a Rectangle as arguments and draw a representation of the Rectangle on the Canvas.

### Week– 9 (Inheritance)

1. Write a program to demonstrate the various types of Inheritances.

### Week– 10(File Concepts)

1. Write a program to merge two given file contents into a third file.
2. Write a program to Read text from a text file, find the word with most number of occurrences
3. Write a program that reads a file *file1* and displays the number of words, number of vowels, and blank spaces.

### Week – 11(Packages)

1. a) Install NumPy package with pip and explore it.  
b) Illustrate 1-D and 2-D vector processing and slicing.
2. Explore matplotlib with plotpy and visualize the data.

### TEXT BOOKS:

1. “Python Programming- Using Problem Solving Approach”, Reema Thareja, Oxford
2. “Python Programming-Problem Solving, Packages and Libraries”, Anurag Gupta, G.P. Biswas, Mc Graw Hill



**R-25**  
**COURSE STRUCTURE**  
**&**  
**SYLLABUS**

**For the**  
**II Year**  
**Bachelor of Technology**  
**(B. Tech)**

**With effect from the Academic Year 2025-26**



**IIB.Tech. I Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1	A253402	Probability Theory and Stochastic Processes	3	0	0	3
2	A253403	Signals and Systems	3	0	0	3
3	A253401	Electronic Devices and Circuits	3	0	0	3
4	A253404	Digital Logic Design	3	0	0	3
5	A253405	Control Systems Engineering	2	0	0	2
6	A253005	Innovation and Entrepreneurship	2	0	0	2
7	A253482	Modelling and Simulation Lab	0	0	2	1
8	A253481	Electronic Devices and Circuits Lab	0	0	2	1
9	A253483	Digital Logic Design Lab	0	0	2	1
10	A253581	Linux and Shell Scripting	0	0	2	1
11	A253105	Environmental Science	1	0	0	1
<b>Total</b>			<b>17</b>	<b>0</b>	<b>8</b>	<b>21</b>

**II B.Tech. II Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1	A254002	Numerical Methods and Complex Variables	3	0	0	3
2	A254402	Electromagnetic Fields and Transmission Lines	3	0	0	3
3	A254403	Analog and Digital Communications	3	0	0	3
4	A254404	Electronic Circuit Analysis	3	0	0	3
5	A254405	Linear and Digital IC Applications	3	0	0	3
6	A254081	Computational Mathematics Lab	0	0	2	1
7	A254483	Analog and Digital Communications Lab	0	0	2	1
8	A254484	Electronic Circuit Analysis Lab	0	0	2	1
9	A254485	Linear and Digital IC Applications Lab	0	0	2	1
10	A254581	Web and Mobile Applications	0	0	2	1
<b>Total</b>			<b>15</b>	<b>0</b>	<b>10</b>	<b>20</b>



**PROBABILITY THEORY AND STOCHASTIC PROCESSES**

**II B.Tech I Semester (ECE)**

**Course Code: A253402**

**Pre-requisite: Mathematics**

**Course Objectives:**

1. Understand the concept of random variable and its classification
2. Comprehend the significance of distribution and density functions of random variable.
3. Interpret the principle of joint random variables and computation of their statistical parameters.
4. Realize the concept of a random process and its analysis in both time and frequency domain.
5. Understand the effect of an LTI system on its random excitation and Noise

**Course Outcomes:**

After going through this course the student can

1. Determine the applications of various random variables based on individual Cumulative Distribution Function and Probability Density Function.
2. Compute the various statistical averages of single/multiple random variables and enumerate their significance.
3. Analyze a random variable as a function of time, with reference to its temporal and spectral characteristics.
4. Determine the effect of an LTI system on the time domain and frequency domain characteristics of the random excitation.
5. Analyze a noise in various basic Electrical and Communication System

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	-	2	-	-	-	-	-	-	-	3	-
<b>CO2</b>	3	3	-	2	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	3	3	2	-	-	-	-	-	-	-	3	-
<b>CO4</b>	3	3	3	2	-	-	-	-	-	-	-	3	-
<b>CO5</b>	3	3	3	3								3	-

**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, 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 and Density Functions, Conditional Distribution and Density Functions, 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.

## **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 Stationary, Definitions of The 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, Basic Definitions of Narrow Band noise, Quadrature representation of narrow band noise.



**TEXTBOOKS:**

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

**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 (TMH), 2008
5. Y Mallikarjuna Reddy - Probability Theory and Stochastic Processes, 4<sup>th</sup> Edition, University Press



## SIGNALS AND SYSTEMS

**II B.Tech I Semester (ECE)**

**Course Code: A253403**

**Pre-requisite: Mathematics**

**Course Objectives:**

1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI Systems, convolution and correlation properties.
3. Understand Laplace and Z-transforms and their properties for analysis of signals and systems.
4. Identify the need for sampling of CT signals, types and merits and demerits of each type.

**Course Outcomes:**

After going through this course the student can

1. Analyze and classify signals and systems using vector space concepts, orthogonality, and standard signal representations.
2. Represent and analyze continuous-time signals using Fourier series and Fourier Transform techniques.
3. Analyze signal transmission through linear systems using convolution, transfer functions, and bandwidth concepts.
4. Apply Laplace Transform and correlation techniques to analyze continuous-time signals and systems.
5. Apply sampling theorem and Z-Transform techniques for analysis of continuous-time and discrete-time signals.

L	T	P	C
3	0	0	3

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	1	–	–	–	–	–	–	–	3	–
CO2	3	3	2	2	–	–	–	–	–	–	–	3	–
CO3	3	3	2	1	–	–	–	–	–	–	–	3	–
CO4	3	3	3	2	–	–	–	–	–	–	–	3	–
CO5	3	3	2	2	–	–	–	–	–	–	–	3	–

### 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. 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 rise time.

### **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

### **UNIT – V**

**Sampling theorem:** Graphical and analytical proof of Sampling Theorem for Base band/Band Limited Signals and Band Pass Signals, Types of Sampling: Impulse Sampling, Natural and Flat top 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.

### **TEXT BOOKS:**

1. Lathi B P, Signals, Systems & Communications, B.S. Publications, 2003.
2. Alan V. Oppenheim, Alan S. Willsky, Syed Hamid Nawab, Signals and Systems, Prentice Hall India, 1997

### **REFERENCE BOOKS:**

1. Simon S. Haykin, Barry Van Veen, Signals and Systems, Wiley, 2003
2. Rama Krishna Rao A, Signals and Systems, 2008, Tata McGraw Hill, 2008.



**ELECTRONIC DEVICES AND CIRCUITS**  
(Common for ECE & EEE)

**II B.Tech I Semester**

**Course Code: A253401**

L	T	P	C
3	0	0	3

**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.

**Course Outcomes:**

After going through this course, the student can

1. Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.
2. Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) & Field Effect Transistors and analyze their input and output characteristics.
3. Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.
4. Analyze transistor amplifier circuits using small signal models and assess performance for various configurations.
5. Analyze the structure and working of Special purpose diodes and advanced devices like FinFETs and CNTFETs.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	-	2	-
CO2	3	3	2	2	1	-	-	-	-	-	-	2	1
CO3	3	3	3	2	1	-	-	-	-	-	-	2	2
CO4	3	3	3	2	2	-	-	-	-	-	1	2	-
CO5	3	3	2	2	2	1	-	-	-	-	2	2	2

**UNIT-I:**

**Diode Characteristics and Applications:** PN junction diode – V-I 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 – V-I 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.

**Field Effect Transistors (FET):** JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes —Structure, operation and 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 h parameter model for CE amplifier.

**FET Amplifiers:** FET Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers.

**UNIT-V:**

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

**Advanced Devices:** FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic transport, fabrication, Comparison: CMOS vs. FinFET vs. CNTFET.

**TEXTBOOKS:**

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

**REFERENCEBOOKS:**

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



**DIGITAL LOGIC DESIGN**

**II B.Tech I Semester (ECE)**

**Course Code: A253404**

**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.

**Course Outcomes:**

After going through this course the student can

1. Apply number systems, codes, and logic gates in digital system design
2. Minimize Boolean functions using K-maps and implement using logic gates.
3. Design and analyze combinational logic circuits.
4. Design and analyze sequential logic circuits.
5. Analyze Moore and Mealy machines and explain memory & PLDs.

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	2	2	1	-	-	-	-	-	1	-	1
<b>CO2</b>	3	3	3	2	2	-	-	-	-	-	1	-	2
<b>CO3</b>	3	3	3	2	2	-	-	-	-	-	1	-	3
<b>CO4</b>	3	3	3	2	2	-	-	-	-	-	1	-	3
<b>CO5</b>	3	2	3	2	3	-	-	-	-	-	2	-	3

**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, Flip-Flop Conversions, 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)

**TEXT BOOKS:**

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

**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.



**CONTROL SYSTEMS ENGINEERING**

**II B.Tech I Semester (ECE)**

**Course Code: A253405**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Pre-Requisites:**

Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus  
Laplace Transforms, Numerical Methods and Complex variables

**Course Objectives:**

1. To introduce the fundamental concepts, classifications, and mathematical modeling of control systems for mechanical and electrical domains.
2. To analyze control system behaviour in time and frequency domains and stability criteria using root locus, Bode plot, Nyquist plot, etc.
3. Design and evaluate compensators and controllers to improve system performance.
4. Explain state-space representation, solution of state equations, and assess system controllability and observability.

**Course Outcomes:**

After going through this course the student can

1. Describe open- and closed-loop systems, and develop mathematical models using block diagrams and signal flow graphs.
2. Analyze the time-domain response of control systems, evaluate transient and steady-state performance, and apply PID controllers to improve system behavior..
3. Determine the stability of control system using Routh-Hurwitz Criterion and root locus technique and assess the effects of poles and zeors on system performance.
4. Analyse frequency response plots including Bode, Polar, and Nyquist plots and investigate system stability.
5. Apply the state-variable approach and analyze controllability and observability.

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	2	2	1	1	-	-	-	-	-	-	2	1
<b>CO2</b>	3	3	2	1	1	-	-	-	-	-	-	2	1
<b>CO3</b>	3	3	2	1	1	-	-	-	-	-	-	2	-
<b>CO4</b>	3	3	3	2	1	-	-	-	-	-	-	2	-
<b>CO5</b>	3	3	2	1	1	-	-	-	-	-	-	2	2

**UNIT-I**

**Control System fundamentals:** Classification of control systems, Open and Closed loop systems. Mathematical modelling of Translational and Rotational mechanical systems, Blockdiagram reduction and Signal flow graphs.



## **UNIT-II**

**Time response Analysis:** Transfer function and Impulse response, types of input. Transient response of second order system for step input. Time domain specifications. Types of systems, static error coefficients, Effects of proportional derivative, proportional integral systems and PID controllers, Application of Proportional, Integral and Derivative Controllers.

## **UNIT-III**

### **Stability analysis in S- Domain:**

The concept of stability – Routh’s stability criterion – qualitative stability & conditional stability – limitations of Routh’s stability.

**Root Locus technique:** The root locus concept – construction of root loci-effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

## **UNIT-IV**

**Frequency response Analysis:** Frequency domain specifications, Bode plots, Gain margin and Phase Margin. Polar plot, Nyquist plot and Nyquist criterion for stability.

**Compensation techniques:** Types of Compensation, Introduction to phase Lag, Lead and Lead-Lag Compensators.

## **UNIT-V**

**State space representation:** Concept of state and state variables. State models of linear time invariant systems, Derivation of State model from transfer function, Derivation of transfer function from State model, State transition matrix and its Properties, Controllability and observability.

## **TEXT BOOKS:**

1. I.J.Nagrath and M.Gopal, Control System Engineering, 5ed., New Age Publishers, 2009.
2. Nagoorkani A, Control Systems Engineering, CBS PUB & DIST, 2020

## **REFERENCE BOOKS:**

1. K.Ogata, Modern Control Engineering, 2ed., Prentice Hall, 2010.
2. M.Gopal, Control Systems: Principles and Design, Tata McGraw-Hill, 1997.
3. Norman S.Nise, Control Systems Engineering, 5ed., John Wiley & Sons, 2007.



## **INNOVATION AND ENTREPRENEURSHIP**

**II B.Tech I Semester (ECE)**

**Course Code: A253005**

L	T	P	C
2	0	0	2

### **Course Objectives:**

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

### **Course Outcomes:**

- 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.

### **Syllabus:**

#### **UNIT – I:**

**Fundamentals of Innovation and Entrepreneurship Innovation:** Introduction, need for innovation, Features, Types of innovations, 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, 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, market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Porter’s Five Force Model. Idea generation, Ideation techniques: Brainstorming, SCAMPER, Design thinking principles.

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

Core Teaching Tool: Venture Activity, Class activity

#### **UNIT– IV:**

**Business & Financial Models:** Introduction to Business Model and types, 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, analyzing financial performance. Go-To-Market (GTM) approach,

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, 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, Copyright, trademark, and GI. Licensing and transfer of technology.

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

#### **TEXT BOOKS:**

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.



**Department of Electronics and Communication Engineering**  
(Accredited by NBA)

2. Ajay Batra, The Stratup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).

**REFERENCES:**

1. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
2. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.

**MODELLING & SIMULATION LAB**

**II B.Tech I Semester (ECE)**

**Course Code: A253482**

L	T	P	C
0	0	2	1

**Note:**

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 12 experiments are to be completed / simulated.

**Course Outcomes:**

After going through this course the student

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

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	3	3	3	2	-	-	3	1	-	3	-
CO2	3	2	3	3	3	2	-	-	3	1	-	3	-
CO3	3	2	3	3	3	2	-	-	3	1	-	3	-
CO4	3	2	3	3	3	2	-	-	3	1	-	3	-
CO5	3	2	3	3	3	2	-	-	3	1	-	3	-

**List of Experiments:**

**Signals and Systems (Minimum 7 Experiments)**

1. Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.



2. Perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.
3. Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
4. Write the code / script for finding the output of a System for a given input and Impulse Response.
5. Write the code / script for finding Auto Correlation and Cross Correlation of Signals / sequences
6. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant.
7. 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
8. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform.
9. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform. Also plot pole-zero diagram in S-plane.
10. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform. Also plot pole — zero diagram in Z-plane.
11. Gibbs Phenomenon.

#### **Probability Theory and Stochastic Processes (Any 3 Experiments)**

12. Write the code / script for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
13. 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.
14. Write the code / script for Removal of noise from the signal using Cross correlation.
15. Write the code / script for Extraction of Periodic Signal masked by noise using Auto Correlation

#### **Control Systems (Minimum 2 Experiments)**

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

#### **Application 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](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>

**ELECTRONIC DEVICES AND CIRCUITS LAB**  
(Common for ECE & EEE)

**II B.Tech I Semester**

**Course Code: A253481**

L	T	P	C
0	0	2	1

**Note:**

- Minimum of 12 experiments are to be completed.

**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.

**Course Outcomes:**

After completing this course, students will be able to:

1. Analyze the V-I characteristics of semiconductor devices such as diodes, BJTs, and FETs.
2. Design and evaluate basic rectifier circuits.
3. Demonstrate biasing techniques for BJT and determine their operating point using DC load line analysis.
4. Design and analyze transistor amplifier circuits in various configurations using small signal models.
5. Simulate and interpret electronic circuits using appropriate simulation tools.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	-	-	-	-	-	-	2	-
CO2	3	3	3	2	1	1	-	-	-	-	-	2	-
CO3	3	3	2	2	1	-	-	-	-	-	-	2	-
CO4	3	3	3	2	1	-	-	-	-	-	1	3	-
CO5	2	2	2	3	3	-	-	-	-	-	2	2	-

**List of Experiments:**

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



1. Plot the V–I characteristics of a PN junction diode in forward and reverse bias to determine cut-in voltage and dynamic resistance.
2. Plot the V–I characteristics of a Zener in forward and reverse bias to determine cut-in voltage and break down voltage.
3. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
4. Design and analyze half-wave with and without capacitor filters to evaluate ripple factor and output voltage.
5. Design and analyze full-wave rectifiers (center-tap) with and without capacitor filters to evaluate ripple factor and output voltage.
6. Plot the input and output characteristics of a BJT in common emitter configuration to determine the value of h parameters.
7. Design and test voltage divider bias circuit to establish a stable operating point for a BJT amplifier and draw the DC load line behavior.

**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 the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
4. Simulate a common emitter amplifier to analyze the effect on voltage gain and signal amplification.
5. Simulate a common source amplifier to analyze the effect on voltage gain and signal amplification.
6. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
7. Design and simulate a CMOS inverter to study digital switching behavior and low-power logic design.

**Hardware Requirements:**

1. Regulated DC Power Supply ( 0-30 V)
2. Function Generators
3. Digital Multimeter
4. Cathode Ray oscilloscope or DSO
5. Breadboards and connecting wires
6. Resistors, Capacitors Diodes
7. BJTs, JFETs, and MOSFETS
8. Trainer kits (optional)

**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. PSICE for TI or OrCAD Lite
6. Windows PC



## DIGITAL LOGIC DESIGN LAB

**II B.Tech I Semester (ECE)**

**Course Code: A253483**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Note:**

- Minimum of 12 experiments are to be completed.

### Course Overview:

This laboratory course provides hands-on experience with the design, analysis, and simulation of digital circuits. Students begin by constructing and testing basic digital components using logic gate ICs, covering Boolean minimization, arithmetic circuits, code converters, and combinational building blocks. The second part focuses on implementing equivalent and advanced designs using Verilog HDL, exploring various modeling styles—dataflow, behavioral, and structural—along with simulation tools. The course emphasizes both foundational logic principles and modern digital system development practices.

### Course Outcomes:

After completing this course, students will be able to

1. Analyze and simplify Boolean expressions and implement them using logic gates and ICs.
2. Design and realize combinational and sequential logic circuits using logic gate hardware.
3. Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.
4. Simulate and verify digital designs using industry-standard EDA tools and test benches.
5. Build modular and hierarchical designs such as counters, FSMs, and shift registers.

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	2	2	2	-	-	-	-	-	1	3	1
<b>CO2</b>	3	3	3	2	2	-	-	-	-	-	1	3	1
<b>CO3</b>	3	3	3	2	3	-	-	-	-	-	2	3	2
<b>CO4</b>	2	2	2	3	3	-	-	-	-	-	2	2	3
<b>CO5</b>	3	3	3	2	3	-	-	-	-	-	2	2	3

### List of Experiments:

#### A. Realization in Hardware Laboratory (Using Logic ICs)

These are fundamental hands-on experiments conducted using logic ICs such as AND, OR, NOT, NAND, NOR, XOR gates, flip-flops, multiplexers, and decoders.

1. Realize and minimize Boolean functions using basic gates and universal gates



(NAND/NOR) in SOP/POS form.

2. Design and implement Half Adder, Full Adder, Half Subtractor, and Full Subtractor using logic gates.
3. Construct and analyze basic logic gates (AND, OR, NOT, XOR, XNOR) using only NAND and NOR gates.
4. Design and implement parity bit generators (even and odd) and a 4-input majority logic circuit.
5. Design and implement code converters such as Binary to Gray, Gray to Binary, and BCD to Excess-3 using gates.
6. Design and implement simple combinational circuits: 2-to-1 multiplexer, 1-bit comparator, and 7-segment decoder logic.

### **B. Verilog HDL-Based Digital Design Experiments (Simulation-Based)**

These experiments are implemented using **Verilog HDL** with different modeling styles (dataflow, behavioral, structural) and simulated using tools like **Vivado, ModelSim, or Xilinx ISE**.

1. Design and simulate a 2-bit comparator using data flow modeling; extend it to 4-bit using structural modeling.
2. Implement a 2:1 multiplexer using data flow modeling and design an 8:1 multiplexer using structural modeling.
3. Design a 2-to-4 decoder using data flow modeling and realize a 3-to-8 decoder using structural modeling.
4. Implement a given Boolean function using a decoder-based approach in behavioral modeling.
5. Design and simulate a universal n-bit shift register (left, right, hold, parallel load) using behavioural modeling.
6. Design a synchronous MOD-n counter using behavioural modeling with D or JK flip-flops.
7. Design and simulate an asynchronous (ripple) counter for a custom sequence using structural modeling.
8. Implement a sequence detector for a given binary pattern using FSM (Moore/Mealy) in behavioural modeling.

### **Required Hardware (for Hardware Lab Experiments)**

<b>Component</b>	<b>Description</b>
Digital Trainer Kit	Breadboard with power supply and clock generator
Logic ICs	7400 (NAND), 7402 (NOR), 7408 (AND), 7432 (OR), 7486 (XOR), 7404 (NOT), etc.
Flip-Flop ICs	7474 (D Flip-Flop), 7476 (JK Flip-Flop)
MUX/Decoder ICs	74153, 74138, 74139



LEDs, switches, connecting wires	For I/O interface and testing
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**Required Software Tools (for Verilog HDL Experiments) (Any one of the tools given below)**

<b>Software</b>	<b>Purpose</b>
Xilinx Vivado	HDL simulation and synthesis (preferred tool)
ModelSim	Verilog simulation and waveform analysis
Xilinx ISE	Legacy support for simulation and FPGA design



## LINUX AND SHELL SCRIPTING

**II B.Tech I Semester (ECE)**

**Course Code: A253581**

L	T	P	C
0	0	2	1

### Course Outcomes:

At the end of the course, student will be able to:

1. Understand Linux system structure, OS architecture, and command-line environment.
2. Perform Linux installation and basic administration including file, user, and permission management.
3. Develop shell scripts to automate tasks such as backups, monitoring, and data processing.
4. Use Linux tools for software management, networking, and service configuration.
5. Implement backup, recovery, and basic troubleshooting techniques through practical labs.

### List of Experiments:

#### Week 1: Introduction to OS Concepts

**Lab Activity:** Linux History, Opensource software basics & Licenses, Why Linux vs windows Identify system and application software on your PC. Differentiate their roles and explain basic OS functions.

#### Week 2: Linux Architecture & Kernel Types

**Lab Activity:** Compare Monolithic and Microkernel architectures using diagrams. Discuss how Linux's structure supports device-level control.

#### Week 3: Installing Linux (Ubuntu/CentOS)

**Lab Activity:** Install Linux using VirtualBox or WSL. Document each installation step and troubleshoot any permission or hardware issues.

#### Week 4: Linux Filesystem & Navigation

**Lab Activity:** Navigate key directories like /home, /etc, and /var. Create folder structures for a team project.

#### Week 5: File Permissions & Ownership

**Lab Activity:** Set permissions on project folders so only group members can access/edit them. Verify permissions using multiple users.

#### Week 6: User and Group Management

**Lab Activity:** Create users and groups for a coding team. Set up shared access using group permissions and configure hidden config files.

**Week 7: Process Management Lab Activity:** Identify and terminate frozen or unresponsive processes during compilation using commands like ps and top.



### **Week 8: Process Priorities & Memory Tools**

**Lab Activity:** Adjust priority of background jobs using nice and monitor system memory usage with vmstat and free. Display information about the processes using top and kill the applications/processes with the task id

### **Week 9: Shell Scripting Basics**

**Use Case:** System Info Script for Lab Login

**Lab Activity:** Create a shell script that automatically displays system uptime, current date/time, available disk space, and active users each time a lab user logs in. Use variables and echo statements to present the information in a readable format.

### **Week 10: Loops, Functions, and Cron Jobs**

**Use Case:** Automated Backup Scheduler for Project Folders

**Lab Activity:** Write a shell script that loops through all user folders in /home and backs them up to a predefined backup location. Add functions for logging success/failure. Schedule it to run daily at 2 AM using cron. Handle missing folders gracefully.

### **Week 11: Text Processing & Networking Utilities**

**Use Case:** Security Log Analysis & Network Check After Intrusion Alert

**Lab Activity:** Analyze /var/log/auth.log or /var/log/secure to detect failed login attempts using grep, awk, cut, and sort. Use ping, trace route, net stat, nbt stat, arp and scp to check remote system connectivity and transfer reports securely.

Concepts of Linux clusters, Virtual machines (virtual box in chapter 3), creating VMs, allocating resources, interconnection between VMs, Containers concepts

### **Week 12: Service Management & Disk Mounting**

**Use Case:** Adding Extra Storage Without Reboot

**Lab Activity:** Create a new virtual disk in Virtual Box. Partition and format it. Mount it to /mnt/data and ensure it auto-mounts on reboot. Enable a required service (like ssh or apache2) using systemctl and check its status.

### **Week 13: Backup & Recovery**

**Use Case:** Disaster Recovery After Accidental Deletion

**Lab Activity:** Use a backup script to create a backup of critical folders. Simulate file deletion and restore them using your backup. Analyze /var/log/syslog or equivalent to trace user activity that led to the issue.

### **Week 14: Mini Project – Tool Development**

**Use Case:** Custom Shell Tool for New Employee Onboarding or Admin Task

**Lab Activity:** Develop a complete shell-based tool. Examples:

A user account creation wizard for new employees

A disk usage monitoring alert system

A log cleaner tool that archives and clears logs weekly

Include user prompts, help menu, error checks, and logging features



**Final Demo & Viva**

**ENVIRONMENTAL SCIENCE**  
(Common to all branches)

**II B.Tech I Semester**

**Course Code: A253105**

L	T	P	C
1	0	0	1

**Course Objectives:** This course is expected to enable the student:

- Describe ecosystem components, functions, and their societal relevance.
- Explain natural resource classification, management, and challenges.
- Analyze pollution types, impacts, and control measures.
- Evaluate global environmental issues, policies, and EIA's role in sustainability.

**Course Outcomes:** After completion of the course, the student will be able to:

- CO1:** Describe ecosystem structure, functions, and biodiversity conservation.
- CO2:** Analyze natural resource management and alternative energy options.
- CO3:** Evaluate biodiversity threats and conservation frameworks.
- CO4:** Identify pollution sources, impacts, and control technologies.
- CO5:** Apply environmental policies and EIA for sustainable management.

**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, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity

**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. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ 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, Pollution control technologies; 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.

#### **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.

#### **TEXT BOOKS:**

1. Anjaneyulu, Y., Introduction to Environmental Science, BS Publications, 2<sup>nd</sup> Edition, 2017.
2. Bharucha, E., Textbook of Environmental Studies for Undergraduate Courses, University Grants Commission, 3<sup>rd</sup> Edition, 2021.
3. Rajagopalan, R., Environmental Studies, Oxford University Press, 3<sup>rd</sup> Edition, 2023.

#### **REFERENCE BOOKS:**

1. Wright, R. T., Environmental Science: Towards a Sustainable Future, PHI Learning Pvt. Ltd., Revised Edition, 2008.
2. Masters, G. M., & Ela, W. P., Environmental Engineering and Science, PHI Learning Pvt. Ltd., 1st Edition, 2008.
3. Botkin, D. B., & Keller, E. A., Environmental Science: Earth as a Living Planet, Wiley India, 8th Edition, 2012.
4. Kaushik, A., & Kaushik, C. P., Perspectives in Environmental Studies, New Age International Publishers, 7th Edition, 2021.
5. Reddy, M. A., Textbook of Environmental Science and Technology, BS Publications, 2<sup>nd</sup> Edition, 2007.

#### **ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/109105203>



**NUMERICAL METHODS & COMPLEX VARIABLES**

**II B.Tech II Semester (ECE)**

**Course Code: A254002**

L	T	P	C
3	0	0	3

**Pre-requisites:** Mathematics courses of first year of study.

**Objectives:** To learn

- Various numerical methods to find roots of polynomial and transcendental equations.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations of first order using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

**Course Outcomes:** After learning the contents of this course the students must be able to:

- CO1: Apply the Knowledge to find the root of a given polynomial and transcendental equations.
- CO2: Estimate the value for the given data using interpolation
- CO3: Solve the given first order ODE's using Numerical Techniques
- CO4: Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
- CO5: Expand the complex functions using Taylor's and Laurent's series expansions.

**Syllabus:**

**UNIT-I: Numerical Methods-I: (Algebraic and Transcendental Equations)**

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton- Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

**UNIT-II: Numerical Methods-II (Interpolation & Numerical Integration)**

Finite differences: forward differences, backward differences, central differences, symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae, Lagrange's method of interpolation.

Numerical integration: Trapezoidal rule and Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rules.



**UNIT-III: Numerical Methods-III (Solutions of Initial Value Problems)**

Solutions of Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of second and fourth order for first order

**UNIT-IV: Complex Analysis-I (Function of Complex Variables and Differentiation)**

Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions. (All theorems without Proofs).

**UNIT-V: Complex Integration:**

Introduction, Complex integration-Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residue theorem. (All theorems without Proofs)

**Textbooks:**

1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
2. Introductory methods of numerical analysis 2005. by S. S. Sastry, PHI, 4<sup>th</sup> Edition.

**Reference Books:**

1. Advanced Engineering Mathematics : Kreyszig, John Wiley & sons
2. Numerical methods for Scientific and Engineering Computations, by M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age International publishers.
3. Functions of Complex Variables by J.N.Sharma, Krishna Prakashan Media.



**ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES**

**II B.Tech II Semester (ECE)**

**Course Code: A254402**

**Pre-requisite: Mathematics**

**Course Objectives:**

- To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields and apply them to solve engineering problems.
- 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.
- To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
- To analyze the propagation of waves in transmission line and able to solve transmission line problem using Smith Chart.

**Course Outcomes:**

After going through this course the student will be able to

- Apply electrostatic principles to analyze electric fields, potentials for various charge distributions and boundary conditions.
- Analyze magneto static fields and forces using Biot-Savart's law, Ampere's law and magnetic potentials for steady current systems.
- Apply Maxwell's equations to analyze time-varying electromagnetic fields and evaluate electric and magnetic boundary conditions at material interfaces
- Analyze electromagnetic wave propagation and reflection-refraction characteristics in conducting and dielectric media
- Evaluate and compare transmission line performance, reflections, and impedance matching techniques using analytical methods and Smith Chart.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	2	-	3	-	-	-	-	-	-	3	2

**UNIT I – Electrostatics**

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.

### **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.

### **TEXT BOOKS:**

1. Principles of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, 6<sup>th</sup> Ed., Oxford University Press, Asian Edition, 2015.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8<sup>th</sup> Ed., McGraw Hill, 2014

### **REFERENCE BOOKS:**

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



## ANALOG AND DIGITAL COMMUNICATIONS

**II B. Tech II Semester (ECE)**

**Course Code: A254403**

**Pre-requisite:** Signals and Systems

**Course Objectives:**

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of baseband transmissions.

**Course Outcomes:**

After going through this course the student will be able to

1. Analyse AM, DSB-SC, SSB, FM and PM techniques and explain their generation and detection in time and frequency domains.
2. Explain the operation and performance of AM/FM transmitters and receivers, including superheterodyne and FM systems under noise.
3. Apply pulse modulation, detection and baseband shaping concepts to analyze signal detection in noise and intersymbol interference.
4. Analyse digital modulation schemes and evaluate their bandwidth efficiency, power spectra and noise performance.
5. Apply information theory to evaluate channel capacity and design efficient source and channel coding schemes.

L	T	P	C
3	0	0	3

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	1	1	–	–	–	–	–	–	2	1
CO2	3	2	1	2	1	–	–	–	–	–	–	1	1
CO3	3	3	2	2	2	–	–	–	–	1	–	3	1
CO4	3	3	3	2	2	–	–	–	–	–	–	3	2
CO5	3	3	2	1	1	–	–	–	–	–	–	2	1

### UNIT – I

#### Amplitude Modulation

Need for modulation, amplitude modulation: time and frequency domain description, generation using switching modulator, detection using envelope detector, DSB-SC modulation: generation using balanced modulator, detection using synchronous detector, COSTAS loop, SSB modulation: time and frequency domain description, generation using phase



discrimination method and demodulation using coherent detection, vestigial sideband modulation and demodulation.

### **Angle Modulation**

Basic concepts of phase modulation, frequency modulation: single-tone frequency modulation, spectrum analysis, Carson's rule, generation of FM waves using Armstrong method, detection of FM waves using phase-locked loop, comparison of FM and AM.

### **UNIT – II**

#### **Transmitters & Receivers**

Classification of transmitters, AM transmitters, FM transmitters, AM receiver – superheterodyne receiver, FM receivers, stereo FM multiplex reception, comparison of AM and FM receivers, noise analysis in AM, DSB, SSB and FM modulation systems, threshold effect in angle modulation systems, pre-emphasis and de-emphasis.

### **UNIT – III**

#### **Pulse Modulation**

Pulse modulation techniques including PAM, PWM and PPM, and a comparison of FDM and TDM.

#### **Detection and Estimation**

Detection of signals in noise, probability of error, optimum coherent receivers including matched filter and correlation receivers and detection of signals with unknown phase.

#### **Baseband Shaping for Data Transmission**

Line encoding requirements, unipolar, polar and bipolar line coding, discrete PAM signalling, inter symbol interference, Nyquist criterion, Duobinary signalling, and eye pattern.

### **UNIT – IV**

#### **Digital Modulation Techniques**

PCM generation and reconstruction, quantization noise, non-uniform quantization and companding, DPCM, DM and adaptive DM, noise in PCM and DM systems.

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, power spectra, bandwidth efficiency, and constellation diagrams.

### **UNIT – V**

#### **Information Theory and Coding**

Entropy, information rate, mutual information, channel capacity of discrete channels, Shannon–Hartley law, trade-off between bandwidth and SNR.

Source coding: Huffman coding, Shannon–Fano coding; channel coding: linear block codes and cyclic codes.



### **TEXT BOOKS**

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

### **REFERENCES**

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



## ELECTRONIC CIRCUIT ANALYSIS

**II B.Tech II Semester (ECE)**

**Course Code: A254404**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 communication systems.

**Course Outcomes:**

After going through this course the student will be able to

1. Analyze and classify multistage amplifier configurations also apply the hybrid- $\pi$  transistor model to evaluate high-frequency behavior of common-emitter amplifiers.
2. Examine feedback amplifier types and assess the influence of negative feedback on gain stability, bandwidth, and distortion.
3. Design and analyze LC, RC, and crystal oscillators based on the Barkhausen criterion to generate sinusoidal waveforms
4. Design and evaluate the performance analyze of power amplifiers and tuned amplifiers
5. Design and generate output waveforms of multivibrator circuits.

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	2	2	1	1	0	0	0	0	0	3	1
<b>CO2</b>	3	3	3	2	2	0	0	0	0	0	1	3	1
<b>CO3</b>	3	3	3	2	2	1	0	0	0	0	1	3	2
<b>CO4</b>	3	3	3	2	2	0	0	0	0	0	1	2	3
<b>CO5</b>	3	3	3	2	2	1	0	0	0	0	1	2	2

**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 amplifier, Cascode amplifier and Darlington pair amplifier.

**High-Frequency Transistor Model:** Hybrid- $\pi$  model, Hybrid- $\pi$  parameters: Conductances and capacitances, CE short-circuit current gain, 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.

**Tuned Amplifiers:** Introduction, single Tuned capacitive coupled Amplifier – Q factor, frequency response, Concept of stagger tuning amplifier.

#### **UNIT-V:**

**Multivibrators:** Analysis and design of Bistable, Monostable and Astable multivibrators and Schmitt Trigger using transistors.

**Time Base Generators:** General features of time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators, Linearity improvement techniques

#### **TEXTBOOKS:**

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.

#### **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.



**LINEAR AND DIGITAL IC APPLICATIONS**

**II B.Tech II Semester (ECE)**

**Course Code: A254405**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:** The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

**Course Outcomes:**

After going through this course the student will be able to

1. Explain the characteristics and functioning of ideal and practical operational amplifiers and analyze op-amp-based circuits and voltage regulators for analog applications.
2. Analyze and design active filter circuits, waveform generators using operational amplifiers, IC 555 timer, and IC 565 PLL for signal processing applications.
3. Acquire the knowledge and design the Data converters.
4. Apply TTL 74XX and CMOS 40XX series ICs to analyze and implement combinational logic circuits.
5. Apply 74XX series ICs to analyze and implement sequential logic circuits

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	-	-	-	1	-	-	-	3	2
CO2	3	3	3	1	-	-	-	1	-	-	-	3	2
CO3	3	3	3	1	-	-	-	1	-	-	-	3	2
CO4	3	3	3	2	-	-	-	1	-	-	-	3	3
CO5	3	3	3	2	-	-	-	1	-	-	-	3	3

**UNIT-I**

**Operational Amplifier**

Introduction to IC's-advantages, Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Sample & hold Circuit, Differentiators and Integrators, Comparators, Schmitt Trigger, Voltage Regulators- Three Terminal Voltage Regulators, Features of IC 723.

**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-2R ladder 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-Binary to Gray, Gray to Binary, BCD to Excess-3, Decoders, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Parity Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

### **UNIT-V**

#### **Sequential Logic IC's**

Familiarity with commonly available 74XX & CMOS 40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers and Types.

### **TEXTBOOKS**

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

### **REFERENCE BOOKS**

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



**COMPUTATIONAL MATHEMATICS LAB**  
(Common for All Branches)

**II B.Tech II Semester (ECE)**

**Course Code: A254081**

L	T	P	C
0	0	2	1

**Course Objectives:** To learn

1. Solve problems of Eigenvalues 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

**Course Outcomes:** After learning the contents of this paper the student must be able to

1. Develop the code to find the Eigenvalues and Eigen Vectors using Python/MATLAB.
2. Develop the code to find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
3. Write the code to solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

**Syllabus:**

**\*Visualize all solutions graphically through programmes**

**UNIT-I: Eigenvalues and Eigenvectors:**

**6P**

**Programs:**

- Finding real and complex Eigenvalues.
- Finding Eigenvectors.

**UNIT-II: Solution of Algebraic and Transcendental Equations**

**6P**

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:**

**6P**

Jacobi's iteration method and Gauss-Seidal iteration method

**Programs:**

- Solution of a given system of linear equations using Jacobi's method
- Solution of a given system of linear equations using Gauss-Seidal method



**UNIT-IV: First-Order ODEs**

**8P**

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**

**6P**

**Programs:**

- Solving homogeneous ODEs
- Solving non-homogeneous ODEs

**TEXTBOOKS:**

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 Learning.
3. Think Python First Edition, by Allen B. Downey, O'Reilly 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.

**REFERENCE BOOKS:**

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



**II B.Tech II Semester (ECE)**

**Course Code: A254483**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Note:**

- Minimum 12 experiments should be conducted.
- All these experiments are to be simulated either using MATLAB, Commsim or any other simulation package.

**Course Outcomes:**

After going through this course the student will be able to

1. Apply analog communication principles to generate, demodulate, and analyze AM, FM, DSB-SC, and SSB-SC signals in time and frequency domains.
2. Implement and analyze multiplexing and sampling techniques, including FDM and sampling theorem verification, using practical observations.
3. Design and realize pulse modulation systems (PAM, PWM, PPM, PCM, and Delta modulation) using hardware and simulation tools.
4. Generate and evaluate digital modulation schemes (FSK, BPSK, DPSK, QPSK) and analyze constellation diagrams under noise.
5. Analyze advanced digital communication concepts such as ISI, eye diagrams, pulse shaping, source coding, and matched filter performance.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	1	-	3	1	2	2	-	2	3	2	-	3	2
CO2	1	-	3	1	2	2	-	2	3	2	-	3	2
CO3	1	-	3	1	2	2	-	2	3	2	-	2	1
CO4	1	-	3	1	2	2	-	2	3	2	-	3	2
CO5	1	-	3	1	2	2	-	2	3	2	-	3	2

**List of Experiments:**

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. 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
7. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
8. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
9. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
10. Generate PCM Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations
11. Generate Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
12. Generate FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
13. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
14. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
15. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
16. Plot Signal Constellation for BPSK, BFSK and QPSK
17. Analyze the performance of BPSK, BFSK and QPSK under noisy environment through constellation diagram
18. Demonstrate ISI through eye diagram
19. Simulate raised cosine signal and duo binary signals
20. Encode data using Shannon Fano / Huffman Coding through Hardware / Simulator
21. Analyze the performance of a Matched filter.



## ELECTRONIC CIRCUIT ANALYSIS LAB

**II B.Tech II Semester (ECE)**

**Course Code: A254484**

**Note:**

- Minimum 12 experiments should be conducted.

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### 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.

### Course Outcomes:

After going through this course the student will be able to

1. Design and analyze multistage amplifier and evaluate their frequency response.
2. Design and analyze feedback & power amplifiers and evaluate their frequency response.
3. Develop and interpret waveform generation circuits such as oscillators, multivibrators and time base generators.
4. Perform simulations to validate analog circuit performance using industry-standard software tools.
5. Correlate practical results with theoretical predictions and identify deviations due to real-world constraints.

<b>PO CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	3	2	2	1	-	-	-	-	-	3	1
<b>CO2</b>	3	3	3	2	2	1	-	-	-	-	-	3	2
<b>CO3</b>	3	3	3	2	1	-	-	-	-	-	-	3	1
<b>CO4</b>	2	2	3	3	3	-	-	-	-	-	1	2	2
<b>CO5</b>	3	3	2	3	2	1	-	-	-	-	1	2	2

### List of Experiments:

#### 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.
2. Design Hartley oscillator 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 Push Pull power amplifier, analyze input/output waveforms and calculate its efficiency.
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 voltage series/voltage shunt 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 ( $\pm 15V$ , 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)



**LINEAR AND DIGITAL IC APPLICATIONS LAB**

**II B.Tech II Semester (ECE)**

**Course Code: A254485**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Note:**

- Minimum 12 experiments should be conducted.

**Course Outcomes:**

After going through this course the student will be able to

1. Design and implementation of various analog circuits using IC 741.
2. Design and Implementation of Various Multivibrators Using 555 timer.
3. Design and implement low pass and High pass filters and DAC using IC 741.
4. Design and implement various combinational circuits using digital ICs.
5. Design and implement various sequential circuits using digital ICs.

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	-	-	-	3	3	3	-	2	1
CO2	3	3	2	1	-	-	-	3	3	3	-	2	1
CO3	3	3	2	1	-	-	-	3	3	3	-	2	1
CO4	3	3	2	1	-	-	-	3	3	3	-	-	3
CO5	3	3	2	-	-	-	-	3	-	-	-	-	3

**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 inverting Comparator with positive/negative/zero reference voltages using Op-Amp
4. Design first order Active LPF, HPF using Op-Amp
5. Design a Circuit using IC741 to generate square wave and draw the output waveform.
6. Design a Circuit using IC741 to generate triangle wave and draw the output waveform
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its duty cycle..
9. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.



10. Design a 4-bit binary to Gray code converter and verify its truth table.
11. Verify the truth table of priority encoder using IC 74148
12. Design 4-bit function using 8x1 multiplexer digital IC 74138.
13. Design a 4-bit Adder/ Subtractor using digital ICs and Add/Sub the following bits.  
(i) 1010 (ii) 0101 (iii) 1011  
0100    0010    1001
14. Verify the truth table of Decade counter using IC 7490
15. Verify the truth table of Up/down counter using IC 74163
16. Verify the functionality of Universal shift register using IC 74194/195
17. Verify the truth table magnitude comparator IC 7485



## WEB AND MOBILE APPLICATIONS

**II B.Tech II Semester (ECE)**

**Course Code: A254581**

L	T	P	C
0	0	2	1

### Course Outcomes:

At the end of the course, student will be able to:

1. Understand and apply core web technologies (HTML, CSS, JavaScript) for structured, styled, and interactive webpages.
2. Build responsive websites using frameworks like Bootstrap and manage code using Git/GitHub.
3. Create simple server-side functionality using Node.js and store/retrieve data from basic databases.
4. Design and develop mobile applications using Flutter for Android and iOS.
5. Integrate web and mobile development into a functional mini-project with deployment.

### List of Experiments:

#### Week 1: Introduction to the Web

Understand web architecture, clients, servers, and workflows. Explore an existing website's structure and elements using browser DevTools.

#### Week 2: HTML Basics

Learn about different markup languages and their significance. Create a homepage for a static site using paragraphs, headings, lists, links, and images.

#### Week 3: CSS – Layout & Design Foundations

Apply colors, spacing, and layouts using CSS. Practice Flexbox and Grid techniques by cloning a simple website layout.

#### Week 4: Introduction to JavaScript

Understand the Document Object Model (DOM) and basic JavaScript constructs. Add interactivity to a webpage with a 'Contact Us' form that dynamically displays/hides details.

#### Week 5: Combining HTML, CSS, and JavaScript

Integrate skills from previous weeks to start building a personal portfolio website.

#### Week 6: Responsive Design using Bootstrap

Make your site adapt to different screen sizes (mobile, tablet, desktop) using Bootstrap's grid system and components.

#### Week 7: Basic Server Concepts & Node.js

Set up a basic Node.js server to serve web content. Understand server-side fundamentals and simple routing.



**Week 8: Introduction to Databases**

Learn to store and retrieve data in SQLite or MongoDB. Save contact form submissions from your portfolio into a database.

**Week 9: Introduction to Flutter**

Understand Flutter's widget structure and framework basics. Design a simple login and landing page for a mobile app.

**Week 10: Deployment using GitHub**

Learn version control basics with Git and GitHub. Publish your portfolio online via GitHub Pages and collaborate with classmates for code reviews.

**Week 11: Project Work**

Apply all learned skills to build a real-world project such as a club/college event management application integrating both web and mobile interfaces.

**Week 12: Final Presentations**

Present your completed project to classmates, highlighting key features, responsive design, and integration. Gather peer feedback for improvement.

**Mini-Project Example Themes**

- Event registration & tracking for college clubs
- Simple inventory tracking system
- Student feedback & announcement portal
- IoT project dashboards (linking to electronics projects)

**Reference Books:**

1. "Web Technologies: HTML, CSS, JavaScript" – Uttam K. Roy (Oxford University Press)
2. "Web Technology: Theory and Practice" – M.N. Rao & P.S. Rao (Pearson)
3. "Web Technologies: TCP/IP, Web/HTTP, Web Servers, Web Applications, and Cloud Computing" – Achyut S. Godbole & Atul Kahate (McGraw-Hill Education)
4. "Mobile Application Development" – Debasis Samanta & Goutam Kumar Panda (Prentice Hall India)
5. "Full Stack Web Development" – V. Srinivasa Rao (Notion Press)