ESTD: 2009

# CMR TECHNICAL CAMPUS

UGC AUTONOMOUS

Accredited by NBA & NAAC with 'A' Grade

Approved by AICTE, New Delhi and JNTU Hyderabad

## Electronics and Communication Engineering

## I SEMESTER

| S. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 25MA101BS | Matrices and Calculus | 3 | 1 | 0 | 4 |
| 2 | 25CH102BS | Engineering Chemistry | 3 | 0 | 0 | 3 |
| 3 | 25EN103HS | English for Skill Enhancement | 3 | 0 | 0 | 3 |
| 4 | 25CS104ES | Programming for Problem Solving | 3 | 0 | 0 | 3 |
| 5 | 25EC105ES | Basic Electronics | 3 | 0 | 0 | 3 |
| 6 | 25CH106BS | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| 7 | 25EN107HS | English Language and Communication Skills Lab | 0 | 0 | 2 | 1 |
| 8 | 25CS108ES | Programming for Problem Solving Lab | 0 | 0 | 2 | 1 |
| 9 | 25EC109ES | Idea and Innovation Lab | 0 | 0 | 2 | 1 |
| 10 | | Induction Program | | | | |
| | | **Total Credits** | **15** | **1** | **8** | **20** |

## II SEMESTER

| S. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1 | 25MA201BS | Ordinary Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 |
| 2 | 25PH202BS | Advanced Engineering Physics | 3 | 0 | 0 | 3 |
| 3 | 25EC203ES | Basic Electrical Engineering | 3 | 0 | 0 | 3 |
| 4 | 25CS204ES | Data Structures | 3 | 0 | 0 | 3 |
| 5 | 25ME205ES | Computer Aided Engineering Graphics | 0 | 1 | 2 | 2 |
| 6 | 25PH206BS | Advanced Engineering Physics Lab | 0 | 0 | 2 | 1 |
| 7 | 25EC207ES | Basic Electrical and Electronics Engineering Lab | 0 | 0 | 2 | 1 |
| 8 | 25CS208ES | Data Structures Lab | 0 | 0 | 2 | 1 |
| 9 | 25CS209ES | Python Programming Lab | 0 | 0 | 2 | 1 |
| 10 | 25CS210ES | IT Workshop | 0 | 0 | 2 | 1 |
| | | **Total Credits** | **12** | **2** | **12** | **20** |

**III SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | 25EC301PC | Probability Theory and Stochastic Processes | 3 | 0 | 0 | 3 |
| 2 | 25EC302PC | Signals and Systems | 3 | 0 | 0 | 3 |
| 3 | 25EC303PC | Electronic Devices and Circuits | 3 | 0 | 0 | 3 |
| 4 | 25EC304PC | Digital Logic Design | 3 | 0 | 0 | 3 |
| 5 | 25EC305ES | Network Analysis and Synthesis | 2 | 0 | 0 | 2 |
| 6 | 25MB306HS | Innovation and Entrepreneurship | 1 | 0 | 0 | 1 |
| 7 | 25EC307PC | Modelling and Simulation Lab | 0 | 0 | 2 | 1 |
| 8 | 25EC308PC | Electronic Devices and Circuits Lab | 0 | 0 | 2 | 1 |
| 9 | 25EC309PC | Digital Logic Design Lab | 0 | 0 | 2 | 1 |
| 10 | 25EC310SD | LINUX and Shell Scripting | 0 | 0 | 2 | 1 |
| 11 | 25CH311VA | Environmental Science | 1 | 0 | 0 | 1 |
| | | **Total Credits** | **16** | **0** | **08** | **20** |

**IV SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | 25MA401BS | Numerical Methods and Complex Variables | 2 | 0 | 0 | 2 |
| 2 | 25EC402PC | Electromagnetic Fields and Transmission Lines | 3 | 0 | 0 | 3 |
| 3 | 25EC403PC | Analog and Digital Communications | 3 | 0 | 0 | 3 |
| 4 | 25EC404PC | Electronic and Pulse Circuits | 3 | 0 | 0 | 3 |
| 5 | 25EC405PC | Linear and Digital IC Applications | 3 | 0 | 0 | 3 |
| 6 | 25MA406BS | Computational Mathematics Lab | 0 | 0 | 2 | 1 |
| 7 | 25EC407PC | Control Systems | 2 | 0 | 0 | 2 |
| 8 | 25EC408PC | Analog and Digital Communications Lab | 0 | 0 | 2 | 1 |
| 9 | 25EC409PC | Electronic and Pulse Circuits Lab | 0 | 0 | 2 | 1 |
| 10 | 25EC410SD | Web and Mobile Applications | 0 | 0 | 2 | 1 |
| 11 | 25EN411VA | Gender Sensitization Lab | 1 | 0 | 0 | 1 |
| 12 | 25EC412PC | Linear and Digital IC Applications Lab | 0 | 0 | 2 | 1 |
| | | **Total Credits** | **17** | **0** | **10** | **22** |

**V SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | 25EC501PC | Digital Signal Processing | 3 | 0 | 0 | 3 |
| 2 | 25EC502PC | RISC and Microcontroller architectures | 3 | 0 | 0 | 3 |
| 3 | 25EC503PC | CMOS VLSI Design | 3 | 0 | 0 | 3 |
| 4 | 25EC51XPE | Professional Elective-I | 3 | 0 | 0 | 3 |
| 5 | 25EC51XOE | Open Elective-I | 2 | 0 | 0 | 2 |
| 6 | 25EC504PC | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1 |
| 7 | 25EC505PC | RISC and Microcontroller Interfacing Laboratory | 0 | 0 | 2 | 1 |
| 8 | 25EC506PC | CMOS VLSI Design Laboratory | 0 | 0 | 2 | 1 |
| 9 | 25EC507PC | Field-based Research Project | 0 | 0 | 4 | 2 |
| 10 | 25EC508SD | FPGA based System Design | 0 | 0 | 2 | 1 |
| 11 | 25MB509VA | Indian Knowledge System | 1 | 0 | 0 | 1 |
| | | **Total Credits** | **15** | **0** | **12** | **21** |

**VI SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | 25EC601PC | Antenna Design and Wave Propagation | 3 | 0 | 0 | 3 |
| 2 | 25EC602PC | IoT Architectures and Protocols | 3 | 0 | 0 | 3 |
| 3 | 25MB603HS | Business Economics and Financial Analysis | 3 | 0 | 0 | 3 |
| 4 | 25EC62XPE | Professional Elective-II | 3 | 0 | 0 | 3 |
| 5 | 25EC62XOE | Open Elective – II | 2 | 0 | 0 | 2 |
| 6 | 25EC604PC | Advanced Communications Lab | 0 | 0 | 2 | 1 |
| 7 | 25EC605PC | IoT Architectures and Protocols Laboratory | 0 | 0 | 2 | 1 |
| 8 | 25EN606HS | Advanced English Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 9 | 25EC607PC | VLSI Design Verification Laboratory | 0 | 0 | 2 | 1 |
| 10 | 25EC608SD | 5G Practical Lab/Robotic Lab/Drone Lab | 0 | 0 | 2 | 1 |
| 11 | 25EN609VA | Human Values and Professional Ethics* | 1 | 0 | 0 | 1 |
| | | **Total Credits** | **15** | **0** | **10** | **20** |

**VII SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | 25EC701PC | Microwave and Optical Communications | 3 | 0 | 0 | 3 |
| 2 | 25EC702PC | Embedded System Design | 3 | 0 | 0 | 3 |
| 3 | 25MB703HS | Fundamentals of Management for Engineers | 3 | 0 | 0 | 3 |
| 4 | 25EC73XPE | Professional Elective-III | 3 | 0 | 0 | 3 |
| 5 | 25EC74XPE | Professional Elective – IV | 3 | 0 | 0 | 3 |
| 6 | 25EC73XOE | Open Elective – III | 2 | 0 | 0 | 2 |
| 7 | 25EC704PC | Microwave and Optical Communications Laboratory | 0 | 0 | 2 | 1 |
| 8 | 25EC705PC | Embedded System Design Lab | 0 | 0 | 2 | 1 |
| 9 | 25EC706PC | Industry Oriented Mini Project/ Internship | 0 | 0 | 4 | 2 |
| | | **Total Credits** | **17** | **0** | **08** | **21** |

**VIII SEMESTER**

| S.No. | Course Code | Course Title | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | 25EC85XPE | Professional Elective – V | 3 | 0 | 0 | 3 |
| 2 | 25EC86XPE | Professional Elective – VI | 3 | 0 | 0 | 3 |
| 3 | 25EC801PC | Project Work | 0 | 0 | 28 | 14 |
| | | **Total Credits** | **06** | **0** | **28** | **20** |

**PROFESSIONAL ELECTIVES**

**Professional Elective - I**

| | |
|---|---|
| 25EC511PE | Sustainabilityfor Electronics |
| 25EC512PE | CMOS Fabrication and Technology |
| 25EC513PE | Data Communications and Computer Networks |
| 25EC514PE | Computer Organization and Operating Systems |

**Professional Elective - II**

| | |
|---|---|
| 25EC621PE | 5G Communications |
| 25EC622PE | Electronic Measurements and Instrumentation |
| 25EC623PE | Low Power VLSI Design |
| 25EC624PE | Image and Video Processing |

**Professional Elective-III**

| | |
|---|---|
| 25EC731PE | Biomedical Signal and Image Processing |
| 25EC732PE | Wireless Communication Networks |
| 25EC733PE | Design for Testability |
| 25EC734PE | Unmanned Aerial Vehicles and Satellite Imaging |

**Professional Elective-IV**

| | |
|---|---|
| 25EC741PE | Artificial Neural Networks and Deep Learning |
| 25EC742PE | Satellite Communications |
| 25EC743PE | Analog and Mixed Signal IC Design |
| 25EC744PE | DSP Processors and Architectures |

**Professional Elective-V**

| | |
|---|---|
| 25EC851PE | AI for Signal and Image Processing |
| 25EC852PE | Radar Systems |
| 25EC853PE | Intelligent e - Computer Aided Design |
| 25EC854PE | Network Securityand Cryptography |

**Professional Elective-VI**

| | |
|---|---|
| 25EC861PE | Biomedical Instrumentation |
| 25EC862PE | Quantum Technologies |
| 25EC863PE | RF Circuit Design |
| 25EC864PE | Model Based System Engineering |

**OPEN ELECTIVES**

**Open Elective-I:**

| | |
|---|---|
| 25EC511OE | Principles of Communication |
| 25EC512OE | Fundamentals of Cyber Physical Systems |
| 25EC513OE | Fundamentals of AI |

**Open Elective-II:**

| | |
|---|---|
| 25EC621OE | Fundamentals of Image Processing |
| 25EC622OE | Automotive Electronics |
| 25EC623OE | Machine Learning Basics |

**Open Elective-III:**

| | |
|---|---|
| 25EC731OE | Introduction to wireless Communications |
| 25EC732OE | Electronics for Health Care |
| 25EC733OE | Data Mining |

# MATRICES AND CALCULUS

**B.Tech. I Semester** **L T P C**
**Subject Code: 25MA101BS** **3 1 0 4**

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

**Course Objectives:**

1. Applying basic operations on 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.
2. Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form
3. Mean value theorems and their application to the mathematical problems
4. Finding maxima and minima of functions of two and three variables.
5. Evaluation of multiple integrals and their applications.

**Course outcomes:** After completion of this course, The Students will be able to:

1. Apply the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigen values and Eigen vectors, Reduce the quadratic form to canonical form using orthogonal transformations.
3. Solve the applications of the mean value theorems.
4. Examine the extreme values of functions of two variables with/ without constraints.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

**UNIT-I: Matrices** **[8 Lectures]**

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

**UNIT-II: Eigen values and Eigen vectors** **[10 Lectures]**

**Linear Transformation and Orthogonal Transformation:** Eigen values – Eigen vectors and their properties – Cayley-Hamilton Theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton Theorem.

**Quadratic forms and Nature of the Quadratic Forms** – Reduction of Quadratic form to canonical form by Orthogonal Transformation.

**UNIT-III: Single Variable Calculus** **[10 Lectures]**

Limit and Continuous of functions and its properties.

**Mean value theorems:** Rolle's theorem – Lagrange's Mean value theorem – Cauchy's Mean value Theorem – Taylor's Series for single variable, Taylor's Series for function of two variables(All the theorems without proof).

**UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) [10 Lectures]**

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

**UNIT-V: Multivariable Calculus (Integration)** **[10 Lectures]**

Evaluation of Double Integrals (Cartesian and polar coordinates) – change of order of integration (only Cartesian form) – Change of variables for double integrals (Cartesian to polar). Evaluation of Triple Integrals. Applications: Areas by double integrals and volume by Triple integrals.(simple examples)

## TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

## REFERENCE BOOKS:

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

# ENGINEERING CHEMISTRY

**B.Tech. I Semester** **L T P C**
**Subject Code: 25CH102BS** **3 0 0 3**

**Course Objectives:**

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

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Understand the fundamental properties of water and its applications in both domestic and industrial purposes.
2. Analyze basic knowledge of electrochemical processes and their relevance to corrosion and its control methods.
3. Explore the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.
4. Describe the basic concepts and properties of polymers and other engineering materials.
5. Apply the principles of UV-Visible, IR spectroscopy and Raman spectroscopy in analyzing pollutants in dye industries and biomedical applications.

**UNIT-I: Water and its treatment:** **[8 Lectures]**

**Introduction**- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods - Softening of water by ion-exchange processes.

**Desalination of brackish water** – Reverse osmosis. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination. Defluoridation - Nalgonda technique.

**Unit-II: Electrochemistry and Corrosion:** **[8 Lectures]**

**Introduction**- Electrode potential, standard electrode potential, Nernst equation- derivation, electrochemical cell - Galvanic cell, cell representation, EMF of cell. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

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

**UNIT–III: Energy sources: [8 Lectures]**

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

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

**Fossil fuels:** Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bed catalytic cracking.

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

**UNIT - IV: Polymers: [8 Lectures]**

**Definition** - Classification of polymers: Based on origin and tacticity with examples – Types of polymerizations - Addition (free radical addition mechanism) and condensation polymerization.

**Plastics, Elastomers and Fibers:** Definition and applications (PVC, Bakelite, Buna-S, Nylon-6,6, ). Differences between thermoplastics and thermo setting plastics.

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

Biodegradable polymers: Polylactic acid and its applications.

**UNIT-V- Advanced Functional Materials: [8 Lectures]**

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

**Biosensor** - Definition, Amperometric Glucose monitor sensor.

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

## TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010. 2.Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.
2. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

## REFERENCE BOOKS:

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

# ENGLISH FOR SKILL ENHANCEMENT

| | | | | |
|---|---|---|---|---|
| **B.Tech. I Semester** | **L** | **T** | **P** | **C** |
| **Subject Code: 25EN103HS** | **3** | **0** | **0** | **3** |

National Education Policy-2020 aims at preparing students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. It also emphasizes language study and promotion of languages through understanding and proper interpretation. English language is central to the educational eco system. The importance of language as medium of communication for personal, social, official and professional needs to be emphasized for clear and concise expression. Teaching and learning of receptive and productive skills viz., Listening, Speaking, Reading and Writing (LSRW) are to be taught and learnt effectively in the undergraduate Engineering programs. Learners should be encouraged to engage in a rigorous process of learning to become proficient users of English language by adopting a deeply focused and yet flexible approach as opposed to rote learning.

In this connection, suitable syllabus, effective pedagogy, continuous assessments and students' involvement result in productive learning. This course supports the latest knowledge and skill requirements and shall meet specified learning outcomes. The main objectives of English language teaching and learning as medium of communication and for promotion of cultural values are embedded in this syllabus. Efforts are being made in providing a holistic approach towards value- based language learning which equips the learner with receptive as well as productive skills.

The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed textbook for detailed study. The students should be encouraged to read the texts leading to reading comprehension. The time should be utilized for
working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material.

**COURSE OBJECTIVES: This course will enable the students to:**

1. Improve their vocabulary, grammar and use appropriate sentence structures.
2. Develop reading strategies and guessing the meaning from context.
3. Enhance their writing skills, drafting letters, e-mails and resume.
4. Equip the students in comprehending and generating appropriate prompts.
5. Acquire skills for Technical report writing.

**COURSE OUTCOMES:** After completion of this course, The Students will be able to:

1. Identify Choose appropriate vocabulary, grammar and sentence structures in their oral and written communication.
2. Demonstrate their understanding of reading strategies and guessing the meaning from the context.
3. Describe paragraphs, essays, précis, draft letters e-mails and resume.
4. Comprehend and generate appropriate prompts.
5. Use abstracts and reports in various contexts.

**SYLLABUS**

The course content / study material is divided into Five Units.

**UNIT –I**

**Theme: Perspectives**

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

**Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

**Grammar:** Identifying Common Errors in Writing with Reference to Parts of Speech Particularly Articles and Prepositions – Degrees of Comparison

**Reading:** Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

**Writing:** Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely–Nature and Style of Formal Writing.

**UNIT –II**

**Theme: Digital Transformation**

Lesson on 'Emerging Technologies' from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

**Vocabulary:** Homophones, Homonyms and Homographs

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

**Reading:** Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

**Writing:** Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

**UNIT –III**

**Theme: Attitude and Gratitude**

Poems on 'Leisure' by William Henry Davies and 'Be Thankful' - Unknown Author from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

**Vocabulary:** Words Often Confused - Words from Foreign Languages and their Use in English.

**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

**Reading:** Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

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

**UNIT –IV**

**Theme: Entrepreneurship**

Lesson on 'Why a Start-Up Needs to Find its Customers First' by Pranav Jain from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

**Vocabulary:** Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

**Grammar:** Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

**Reading:** Prompt Engineering Techniques– Comprehending and Generating Appropriate

Prompts - Exercises for Practice
**Writing:** Writing Practices- Note Making-Précis Writing.

**UNIT –V**

**Theme: Integrity and Professionalism**

Lesson on 'Professional Ethics' from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

**Vocabulary:** Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

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

**Reading:** Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

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

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

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

**TEXTBOOK**

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

**REFERENCE BOOK**

1. Swan, Michael. (2016). Practical English Usage. Oxford University Press. New Edition.
2. Karal, Rajeevan. 2023. English Grammar Just for You. Oxford University Press. New Delhi, 2024.
3. Empowering with Language: Communicative English for Undergraduates. Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. Communication Skills – A Workbook. Oxford Univeristy Press. New Delhi
5. Wood,F.T. (2007). Remedial English Grammar. Macmillan.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.

# PROGRAMMING FOR PROBLEM SOLVING

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. I Semester** | | | | |
| **Subject Code: 25CS104ES** | **3** | **0** | **0** | **3** |

**Prerequisites: Basic Knowledge on Mathematics and Problem Solving Skills**

**Course Objectives:**

1. To learn the fundamentals of C, conditional and loop statements.
2. To Practice functions and arrays for problemsolving.
3. To work on various strings, pointers and modular programmings.
4. To understand recursion, structures and union programming.
5. To analyze various searching and sorting techniques.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Describe C fundamentals, conditional and loop statements.
2. Demonstrate functions and arrays to solve various problems
3. Analyze various strings, pointers and modular programmings.
4. Use Recursive functions, structures and unions.
5. Develop various searching and sorting techniques.

**UNIT – I:** **[11 Lectures]**

**Overview of C:**C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Operators, Arithmetic Expressions, Formatting Numbers in Program Output.

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

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

**Jump statements:** break, continue, goto, Return.

**UNIT – II:** **[9 Lectures]**

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

**Arrays:** Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.

**UNIT – III:** **[9 Lectures]**

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

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

**UNIT – IV**: **[8 Lectures]**

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

**Structure and Union Types:** User-Defined Structure Types, Structure Type Data as Input and Output

Parameters, Functions with Structured Result Values, Union Types.

**UNIT – V:** **[8 Lectures]**

**Text and Binary File Pointers:** Input/ Output Files – Review and Further Study, Binary Files, Searching a Database.

**Searching and Sorting:** Basic searching in an array of elements (Linear and Binary search Techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

# BASIC ELECTRONICS

| | L | T | P | C |
|---|---|---|---|---|
| **B. Tech. I Semester** | | | | |
| **Subject Code: 25EC105ES** | **3** | **0** | **0** | **3** |

**Prerequisites: Basic knowledge of electricity and magnetism, circuit components, fundamental mathematics and physics of materials.**

**Course Objectives:**

1. To understand the fundamental properties of conductors, semiconductors, and diodes.
2. To study diode applications in rectifiers, filters, and regulated power supplies.
3. To analyze the construction, characteristics, and applications of BJTs.
4. To learn the operation and characteristics of JFETs and MOSFETs with comparisons.
5. To explore special semiconductor devices and their practical applications.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Differentiate conductors, semiconductors, and insulators and explain diode operation.
2. Analyze and design rectifier circuits with filters for dc power supply applications. 3 Evaluate transistor configurations and use BJTs as switches and amplifiers.
3. Demonstrate the operation of FETs and MOSFETs in various modes and applications.
4. Apply knowledge of special semiconductor devices like Zener, SCR, UJT, and LEDs in electronic circuits.

**UNIT I**

**Basics of Semiconductors and Diodes:** Conductors, Semiconductors, and Insulators, Intrinsic and Extrinsic Semiconductors, N-Type and P-Type Semiconductors, Drift Current & Diffusion Current, Operation of PN Junction Diode-No Bias, Forward Bias and Reverse Bias, Volt-Ampere (V-I) Characteristics, Diode Current Equation (Qualitative Treatment), Ideal Versus Practical Diode, Static and Dynamic Resistances, Diode Equivalent Circuits, Breakdown Mechanisms in Semiconductor Diodes.

**UNIT II**

**Applications of Diode:** Block Diagram of Regulated Power Supply, Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, L- section Filters, $\pi$- section Filters.

**UNIT III**

**Bipolar Junction Transistor:** NPN and PNP Transistor Construction, Operation, Symbol, Transistor Current Components, Input & Output Characteristics of a Transistor in CB, CE and CC Configurations, Comparison of CB, CE and CC Configurations, Transistor as a Switch, Transistor Switching Times, Transistor as an Amplifier.

**UNIT IV**

**Field Effect Transistors:** JFET: Structure, operation, and characteristics, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, Comparison of JFET and MOSFET

**UNIT V**

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

**TEXTBOOKS:**

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

**REFERENCE BOOKS:**

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

**ENGINEERING CHEMISTRY LAB**

| **B.Tech. I Semester** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **Subject Code: 25CH106BS** | **0** | **0** | **2** | **1** |

**Course Description:**
The course includes experiments based on fundamental principles of chemistry essential for engineering students, aiming to develop practical skills and reinforce theoretical concepts.

**Course Objectives**
1. To understand and perform experiments based on core chemical principles relevant to engineering applications.
2. To estimate the hardness of water to assess its suitability for drinking purposes.
3. To acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry.
4. To gain hands-on experience in synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
5. To learn to determine the unknown concentration of potassium permanganate (KMnO4) using a calibration curve.

**Course Outcomes:** After completion of this course, The Students will be able to:
1. Develop practical skills through hands-on chemistry experiments relevant to engineering.
2. Determine important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
3. Apply techniques like conductometry, potentiometry to determine concentrations or equivalence points in acid-base reactions.
4. Use experience in synthesizing polymers such as Bakelite and Nylon-6,6.
5. Explore the working principle of colorimetry and the relationship between absorbance and concentration (Beer-Lambert Law).

## List of Experiments:

**I. Volumetric Analysis:**
1. Estimation of Hardness of water by EDTA Complexometry method.
2. Determination of alkalinity in sample of water

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

**III. Potentiometry:**
1. Estimation of concentration of Fe+2ion by Potentiometry using KMnO4.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

**IV. Colorimetry:** Verification of Lambert-Beer's law using KMnO4.

**V. Preparations:**
1. Preparation of Bakelite.
2. Preparation Nylon – 6, 6.

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

**VII. Virtual lab experiments:**

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

## 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 Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

# ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. I Semester** | | | | |
| **Subject Code: 25EN107HS** | **0** | **0** | **2** | **1** |

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

**Course Objectives:**

1. To sensitize the students to the nuances of English speech sounds.
2. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
3. To improve the fluency of students in spoken English and neutralize the impact of dialects.
4. To improve the students creative skills in story telling and to differentiate the literal and implied meanings.
5. To train students to use appropriate language in presentations.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Identifyand practice English sounds according to standard pronunciation.
2. Interpret the nuances of the English language using audio-visual resources and practice sessions.
3. Applystrategies to neutralize their accent and enhance intelligibility.
4. Differentiate the literal and implied meanings and their usage.
5. Demonstrate effective and confident participation in presentations.

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

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

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

**Listening Skills**:

**Objectives**

1. To enable students to develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds

**Speaking Skills:**

3. To improve their pronunciation and neutralize accent
4. To enable students express themselves fluently and appropriately
5. To practice speaking in social and professional contexts

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

**Exercise – I CALL Lab:**

**Instruction:** Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening

**Practice:** Listening to Distinguish Speech Sounds (Minimal Pairs) - Testing Exercises

ICS Lab:

**Diagnostic Test** – Activity titled 'Express Your View'

**Instruction:** Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others

**Practice:** Any Ice-Breaking Activity

**Exercise – II CALL Lab:**

**Instruction:** Listening vs. Hearing - Barriers to Listening

**Practice:** Listening for General Information - Multiple Choice Questions - Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)

**ICS Lab:**

**Instruction:** Features of Good Conversation – Strategies for Effective Communication

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

**Exercise - III CALL Lab:**

**Instruction:** Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)

**Practice:** Differences between British and American Pronunciation –Listening Comprehension Exercises

**ICS Lab:**

**Instruction:** Describing Objects, Situations, Places, People and Events

**Practice:** Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events (A wide range of Materials / Handouts are to be made available in the lab.)

**Exercise – IV CALL Lab:**

**Instruction:** Techniques for Effective Listening

**Practice:** Listening for Specific Details - Listening - Gap Fill Exercises - Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.)

**ICS Lab:**

**Instruction:** How to Tell a Good Story - Story Star- Sequencing-Creativity

**Practice:** Activity on Telling and Retelling Stories - Collage

**Exercise – V CALL Lab:**

**Instruction:** Identifying the literal and implied meaning

**Practice:** Listening for Evaluation - Write the Summary – Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.)

**ICS Lab:**

**Instruction:** Understanding Non-Verbal Communication, Presentation Skills

**Practice:** Silent Speech - Dumb Charades Activity, Making a Presentation.

Post-Assessment Test on 'Express Your View'

**Minimum Requirement of infrastructural facilities for ELCS Lab:**

1. Computer Assisted Language Learning (CALL) Lab:

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

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

Note: English Language Teachers are requested to prepare Materials / Handouts for each Activity for the Use of those Materials in CALL & ICS Labs.

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

**REFERENCES BOOKS:**

1. Shobha, KN & Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
2. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.
3. Orient BlackSwan Pvt. Ltd.
4. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press
5. (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
6. Ur, Penny and Wright, Andrew. 2022. Five Minute Activities – A Resource Book for Language Teachers. Cambridge University Press

# PROGRAMMING FOR PROBLEM SOLVING LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. I Semester** | | | | |
| **Subject Code: 25CS108ES** | **0** | **0** | **2** | **1** |

*[Note:The programs may be executed using any available Open Source/ Freely available IDE Some of the Tools available are:*
*CodeLite: https://codelite.org/*
*Code::Blocks: http://www.codeblocks.org/*
*DevCpp :*
*http://www.bloodshed.net/devcpp.html*
*Eclipse: http://www.eclipse.org*
*This list is not exhaustive and is NOT in any order of preference]*

**Co-requisites:** A Course on Programming for Problem Solving.

**Prerequisites:** Basic Knowledge on Mathematics and Problem Solving Skills.

**Course Objectives:**

1. To learn the basics of C Programming
2. To understand basic concepts like operators, control structures and loop statements etc.
3. To practice various file handling techniques.
4. To Explore various string manipulation techniques
5. To analyze various searching and sorting algorithms .

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Demonstrate the basics concepts of C programming.
2. Analyze arrays, pointers and functions to solve problems.
3. Applythe file handing techniques to manage data in the files.
4. Experiment on various String manipulation techniques
5. Develop various sorting and searching techniques

**PRACTICE SESSIONS: Simple numeric problems:**

a) Write a program for finding the max and min from the three numbers. b) Write the program for the simple, compound interest.

c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5
5 x 2 = 10
5 x 3 = 15

d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

**Expression Evaluation:**

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

b) Write a program that finds if a given number is a prime number.

c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

**Arrays, Pointers and Functions:**

a) Write a C program to find the minimum, maximum and average in an array of integers.

b) Write a C program that uses functions to perform the following:
   I. Addition of Two Matrices
   II. Multiplication of Two Matrices

c) Write a program for reading elements using a pointer into an array and display the values using the array.

d) Write a program for display values reverse order from an array using a pointer.

**Files:**

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

**Strings:**

a) Write a C program that uses functions to perform the following operations:
   I. To insert a sub-string into a given main string from a given position.
   II. To delete n Characters from a given position in a given string

b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

d) Write a C program to count the lines, words and characters in a given text.

**Sorting and Searching:**

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.

b) Write a C program that uses non-recursive function to search for a Keyvalue in a given sorted list of integers using binary search method.

c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d) Write a C program that sorts the given arrayof integers using selection sort in descending order

e) Write a C program that sorts the given arrayof integers using insertion sort in ascending order

f) Write a C program that sorts a given array of names.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

# IDEA AND INNOVATION LAB

| B.Tech. I Semester | L | T | P | C |
|---|---|---|---|---|
| Subject Code: 25EC109ES | 0 | 0 | 2 | 1 |

**Course Objectives:** This course aims to:

1. To Exploring different engineering technologies and their applications.
2. To learn various 3d printing technologies.
3. To Knowledge towards Assembling and testing of robots.
4. To Understanding functionality of 3D printers and their application.
5. To Developing team work and in sight towards different disciplines of Engineering.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Demonstrate the knowledge of various engineering technologies
2. Apply different technologies and Setting up the Arduino.
3. Perform various operations for building and testing of robots.
4. Understand the fundamental concepts of Additive manufacturing and create awareness of its processes and applications.
5. Practice on techniques of fabrication, manufacturing and allied skills.

**UNIT I: Internet of Things**

**Overview of IoT and Architecture:** Brief History, evolution of IoT, Architecture, trends in the Adoption of IoT, Societal Benefits of IoT, Risks, Privacy, Security, Embedded Systems Components, Microcontroller Architecture and Properties and Installing and Setting up the Arduino and Raspberry Pi (RPi) development environment. Build Simple loT Applications by using Arduino or RPi.

**UNIT II: Robotics**

Introduction, Different types of robots, Components of a Robot, Working principle of robots, Applications of robots in various fields, Innovation challenges, Scope of robotics research & its current trends, assembling and testing of Robot.

**UNIT III:3D Printing**

Introduction, Product Design & Development, 3D Scanning & Printing using different types of materials. Components of 3D Printer, Applications of 3D printed products in various fields, Hands on Experience on 3D printing Machine.

**UNIT IV: Software and Post Processing**

Cura, Flash print, 3dslicer, Tinkercad, Meshmixer. 3d printing parameters, print Speed. Layer Height, Infill density.Acetone bathing, Support Structure Removing.

**UNIT V: Case Studies**

Students has to submit a report bydoing a studyon various Engineering applications related to Manufacturing, Retail, Automotive, Logistics, Healthcare, Entertainment and E-Governance.

**REFERENCE BOOKS:**

1. PC Hardware-A Handbook-KateJ. Chase PHI(Microsoft)
2. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinsonand Ken Quamme.- CISCO Press, Pearson Education.
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015,ISBN: 9788173719547.

# ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. II Semester** | | | | |
| **Subject Code: 25MA201BS** | **3** | **1** | **0** | **4** |

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

**COURSE OBJECTIVES:**

1. Methods of solving the differential equations of first order.
2. Methods of solving the differential equations of higher order.
3. Concept, properties of Laplace transforms& Solving Ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions.
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**COURSE OUTCOMES:** After completion of this course, The Students will be able to:

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Use the Laplace Transforms techniques for solving Ordinary Differential Equations.
4. Evaluate Gradient, Divergence and Curl of a vector differential operator.
5. Interpret the Line, Surface and Volume integrals and converting them from one to another

**UNIT-I: First Order Ordinary Differential Equations [8 Lectures]**

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

**UNIT-II: Ordinary Differential Equations of Higher Order [10 Lectures]**

**Higher order linear differential equations with constant coefficients:** Non-Homogeneous terms of the type $e^{ax}$, $\sin ax$, $\cos ax$, polynomials in $x$, $e^{ax}V(x)$ and $x\,V(x)$ – Method of variation of parameters.

**UNIT-III: Laplace Transforms [10 Lectures]**

**Laplace Transforms:** Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' and divided by 't' – Laplace transforms of derivatives and integrals of function – Evaluation of integrals by Laplace transforms – Laplace transform of periodic functions – Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

**UNIT-IV: Vector Differentiation [10 Lectures]**

**Vector point functions and scalar point functions** – Gradient – Divergence and Curl – Directional derivatives – Vector Operators-Scalar potential functions – Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration [10 Lectures]**

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

## TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

## REFERENCES

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

# ADVANCED ENGINEERING PHYSICS

| B.Tech. II Semester | L | T | P | C |
|---|---|---|---|---|
| Subject Code:25PH202BS | 3 | 0 | 0 | 3 |

**Pre-requisites: 10+2 Physics**

**Course Objectives:**

1. To understand fundamental concepts of quantum mechanics and their applications in solids.
2. To understand the working principle of semiconductor devices LED Solar cell and Material characterization techniques like XRD and SEM.
3. To introduce quantum computing principles and quantum gates.
4. To learn the properties and applications of magnetic and dielectric materials.
5. To explore the working and applications of lasers and fibre optics in modern technology.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Apply quantum mechanical principles to explain particle behaviour and energy band formation in solids.
2. Analyze the characteristics of semiconductor devices and apply XRD & SEM techniques for material characterization in nanomaterials.
3. Understand quantum computing concepts and explain basic quantum gates.
4. Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
5. Explain the principles of lasers and fibre optics and their applications in communication and sensing.

**UNIT - I: Quantum Mechanics**

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

**UNIT - II: Semiconductor Physics & Nanotechnology**

**Introduction to Semiconductors:** Intrinsic and extrinsic semiconductor (qualitative), Hall effect, Direct and indirect band gap semiconductors, Construction, principle of operation and characteristics of P-N junction diode, structure, materials and working principle of LED & Solar cell. Concept of Nanomaterials: Introduction to nanoscience and nanotechnology, surface to volume ratio, quantum confinement, Synthesis of Nanomaterials - Ball milling method (Top-down approach), Sol-Gel method (Bottom-up approach), Characterization Techniques - X -ray diffraction: Bragg's law, calculation of average crystallite size using

Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

**UNIT - III: Quantum Computing**

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, entanglement, quantum gates - Pauli-X gate, Hadamard gate, CNOT gate, challenges and advantages of quantum computing over classical computation.

**UNIT - IV: Magnetic and Dielectric Materials**

Introduction to magnetic materials, Basic definitions, classification of magnetic materials, hysteresis, soft and hard magnetic materials, magneto resistance and magnetostriction effect,

applications of magnetic materials and magnets for EV. Introduction to dielectric materials, types of polarization: electronics, ionic & orientation(qualitative); ferroelectric, piezoelectric, pyroelectric materials and their applications: Load Cell and Fire sensor.

**UNIT - V: Laser and Fibre Optics**

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

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

## TEXT BOOKS:

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

## REFERENCE BOOKS:

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

# BASIC ELECTRICAL ENGINEERING

**B.Tech. II Semester** **L T P C**
**Subject Code: 25EC203ES** **3 0 0 3**

**Prerequisites:** Fundamentals in physics and Mathematics

**Course Objectives:**
1. To introduce the concepts of electrical circuits and its components.
2. To study and understand the different types of single phase AC circuits.
3. To study and understand the different types of Transformers.
4. To introduce the concepts of DC and AC machines.
5. To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

**Course Outcomes:** After completion of this course, The Students will be able to:
1. Identify the basic DC electrical circuits.
2. Evaluate the basic single phase AC circuits.
3. Analyze the concepts of single phase transformers
4. Classify the concepts of Electrical Machines.
5. Explore components of Low Voltage Electrical Installations.

**UNIT- I :**
**D.C. CIRCUITS:** Introduction, Types of elements, Definitions, Ohm's law and its limitations, R-L-C parameters, Energy sources-Ideal and practical voltage and current sources(Independent only), Series and Parallel combination of Resistances, Inductances and Capacitances, current division and voltage division principles, Delta to Star and Star to Delta Transformation, Kirchhoff's Laws, Mesh analysis, Nodal analysis.

**UNIT-II :**
**A.C. CIRCUITS:** Representation of sinusoidal waveforms, Instantaneous value, Peak value, Average and RMS value, Form factor and Peak factor for sinewave, Saw tooth and Square Waveforms, Phasor representation, Real power, Reactive power, Apparent power, Power factor, Analysis of single- phase ac circuits consisting of R,L,C, RL, RC, RLC series combination**.**

**UNIT – III :**
**Transformers:** Construction, Types, Working principle of Single-phase transformer, EMF equation, problems on emf equation, transformation ratio, Equivalent circuit, Losses in transformers, regulation, Efficiency and Condition for maximum efficiency.

**UNIT – IV :**
**Electrical Machines:** Construction, Working Principle of single loop DC generator, EMF equation, problems on emf equation, Types of dc generators, Working principle of DC motor, types of motors, Torque equation, Three phase induction motor construction and working, Slip and Rotor current frequency, problems on slip and rotor frequency.

**UNIT – V :**
**Electrical Installations:** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

## TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.
3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. V.K. Mehta, Rohit Mehta, Principles of Electrical Engineering and Electronics – S.Chand Publications, 2nd Edition,2014.

## REFERENCE BOOKS:

1. R. L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits – PEI/PHI, 9th Ed, 2006.
2. J. Millman and C. C. Halkias, SatyabrataJit, Electronic Devices and Circuits – TMH, 2/e, 1998.
3. William Hayt and Jack E. Kemmerly, Engineering circuit analysis- McGraw Hill Company, 6th edition,2012.
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
5. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

# DATA STRUCTURES

**B.Tech. II Semester** **L T P C**
**Subject Code: 25CS204ES** **3 0 0 3**

**Prerequisites**: A course on "Programming for Problem Solving

**Course Objectives**

1. To Understand the fundamentals of Various Data Structures.
2. To Implement various binarytree structures and their applications.
3. To learn Advanced tree structures and apply efficient searching techniques.
4. To Find graph representation and applyefficient sorting algorithms
5. To Explore hashing techniques and file organization methods for efficient data management

**Course Outcomes** After completion of this course, The Students will be able to:

1. Apply basic data structures like stacks,listed list and queues.
2. Analyze various search tree .
3. Develop advanced trees ,heaps and its applications.
4. Demonstrate graphs and Sorting Techniques
5. Design various Hashing and file organization techniques.

**UNIT – I** **[10 Lectures]**

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

**UNIT – II** **[10 Lectures]**

**Trees:** Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red –Black Trees, Splay Trees

**UNIT – III** **[9 Lectures]**

**Multi way Search Trees:** Introduction, B Trees, B Trees ADT, 2-3 Trees, B* Tree, B+ Trees

**Heaps:** Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps.

**Applications Searching:** Introduction, Interpolation Search, Jump search

**UNIT – IV** **[8 Lectures]**

**Graphs:** Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs

**Sorting:** Radix Sort, Heap sort, Shell Sort, Tree Sort,

**UNIT – V** **[9 Lectures]**

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

**Files and their Organization:** Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

**TEXTBOOKS:**

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

**REFERENCE:**

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

# COMPUTER AIDED ENGINEERING GRAPHICS

| B.Tech. II Semester | L | T | P | C |
|---|---|---|---|---|
| Subject Code: 25ME205ES | 0 | 1 | 2 | 2 |

**Course Objectives:**

1. To provide basic concepts in engineering drawing. To develop the ability of visualization of objects through technical drawings
2. To impart knowledge about standard principles of orthographic projection of objects.
3. To draw projections of solids and pictorial views of solids and to draw surfaces development of solid for prisms, pyramids, cone and cylinder.
4. To draw isometric views of solids and orthographic projections of solids.
5. To acquire computer drafting skill for communication of concepts, ideas in the design of engineering Products.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Apply computer aided drafting tools to sketch the conventions and the methods of drawings
2. , engineering curves and scales .
3. Understand and draw the projections of points, lines, planes in different types of projections. manually and by using computer aided drafting tools.
4. Appreciate the need of projections of solids (prisms, pyramids, cone and cylinder) manually and by using computer aided drafting tools.
5. Interpret engineering drawings for development of surfaces to Right Regular Solids-prism, manually and by using computer aided drafting tool.
6. Convert of orthographic projection into isometric view and vice versa manually and by using computer aided drafting tool.

**UNIT- I: INTRODUCTION TO ENGINEERING GRAPHICS:**

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid. Scales – Plain and Diagonal. Introduction to CAD Software commands and practice.

**UNIT – II: ORTHOGRAPHIC PROJECTIONS:**

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands and conics. Conventional and by using computer aided drafting.

**UNIT –III: PROJECTIONS OF REGULAR SOLIDS**

Projections of Regular Solids – Prism, Cylinder, Pyramid and Cone. Auxiliary Views, Sections or Sectional views Conventional and by using computer aided drafting.

**UNIT- IV: DEVELOPMENT OF SURFACE**

Development of Surfaces of Regular Solids – Prism, Cylinder, Pyramid and Cone. Conventional and by using computer aided drafting.

**UNIT –V: ISOMETRIC PROJECTIONS**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions –Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa. Conventional and by using computer aided drafting.

**TEXTBOOKS:**

1. Engineering Drawing N.D. Bhatt / Charotar .
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

**REFERENCE BOOKS:**

1. 1.Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. 2.Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

# ADVANCED ENGINEERING PHYSICS LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. II Semester** | | | | |
| **Subject Code: 25PH206BS** | **0** | **0** | **2** | **1** |

**Course Objectives:**

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

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Understanding the concept of impedance, resonant frequency, bandwidth and perform calculations.
2. Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.
3. Analyze semiconductors using Hall effect and energy gap measurement techniques.
4. Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.
5. Apply scientific methods for accurate data collection, analysis, and technical report writing.

1. To studythe resonant frequency, band width and quality factor of LCR circuit.
2. Determination of energy gap of a semiconductor.
3. a. To studythe V-I characteristics of solar cell.
   b. To studythe V-I characteristics of LED.
4. Determination of Hall coefficient and carrier concertation of a given semiconductor.
5. To determine work function and Planck's constant using photoelectric effect.
6. To studythe V-I characteristics of a p-n junction diode.
7. Determination of dielectric constant of a given material.
8. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
9. a. Determination of wavelength of a laser using diffraction grating.
   b. Studyof V-I characteristics of a given laser diode.
10. a. Determination of numerical aperture of a given optical fibre.
    b. Determination of bending losses of a given optical fibre.

**Note: Any 8 experiments are to be performed.**

# BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

| **B.Tech. II Semester** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **Subject Code: 25EC207ES** | **0** | **0** | **2** | **1** |

**Course Objectives:**

1. To introduce the concepts of diodes and transistors.
2. To impart the knowledge of various types of Rectifiers.
3. To Analyze a given network by applying various electrical laws.
4. To Analyze the performance of single phase transformers.
5. To Analyze the performance of transformers, DC and AC machines.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Compare the characteristics of different types of diodes and transistors.
2. Evaluate the performance of Rectifiers with and without filters.
3. Inspect the Ohms law, KCL, KVL with practical approach.
4. Estimate the performance calculations of single phase transformers.
5. Analyze the Performance characteristics of DC and AC machines through various testing methods.

**LIST OF EXPERIMENTS/DEMONSTRATIONS**

**SECTION A : ELECTRONICS ENGINEERING:**

1. Studyand operation of
   (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies iv) CRO
2. PN Junction Diode Characteristics A)Forward bias B) Reverse bias
3. Zener Diode Characteristics A)Forward bias B) Reverse bias
4. Input and Output characteristics of BJT in CE Configuration.
5. Half wave Rectifier without and with Filters.
6. Full wave Rectifier without and with Filters.

**SECTION B: ELECTRICAL ENGINEERING:**

1. Verification of Ohm's law.
2. Verification of KCL and KVL.
3. Brake test on DC Shunt motor.
4. Brake test on 3-phase Induction motor.
5. Load Test on Single-Phase Transformer.
6. Measurement of Voltage, Current and Real Power in Primary and Secondary circuits of a Single Phase Transformer.
7. No Load Characteristics of 3 phase Alternator.

**Note: Total 10 experiments are to be conducted.**
**(Minimum Five experiments from PART-A and Five experiments from PART-B)**

# DATASTRUCTURES LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. II Semester** | | | | |
| **Subject Code: 25CS208ES** | **0** | **0** | **2** | **1** |

**Prerequisites:** A Course on "Programming for Problem Solving".
**Co-Requisites**: A Course on Data Structures.

**Course Objectives:**

1. To understand and develop concepts of various Data Structures.
2. To understand various Sorting Methods
3. To provide and understanding of different Tree traversal techniques.
4. To provide and understanding of Graph Traversal methods.
5. To implement Hashing Techniques.

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

1. Use functions to perform Linear Data Structures with its operations.
2. Develop different Sorting methods.
3. implement Tree Traversal Techniques using Recursive and Non Recursive.
4. Illustrate Graph Traversal Techniques BFS and DFS.
5. Demonstrate C Programs for Hash Functions.

**List of Experiments**

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

**TEXT BOOKS:**

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

**REFERENCE BOOK:**

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

# PYTHON PROGRAMMING LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. II Semester** | | | | |
| **Subject Code: 25CS209ES** | **0** | **0** | **2** | **1** |

**Prerequisites:** Basic knowledge on C Programming and students should install Python

**Course Objectives:**

1. To learn basic data types, operators, use of procedural statements like assignments, conditional statements, loops and function calls.
2. To make use of functions and string operations.
3. To work with the data structures like lists, set, dictionaries and tuples in python.
4. To acquire knowledge on object-oriented programming concepts in python.
5. To implement file handling and error handling mechanisms

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

1. Practice the basic concepts of python programming.
2. Apply functions to design modular programming and perform string operations.
3. Analyze various data structures like lists, set, dictionaries and tuples in python.
4. Implement object-oriented programming concepts using python.
5. Build applications using file handling and error handling techniques.

**List of Experiments:**

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.
3. Write a program to calculate compound interest when principal, rate and number of periods are given.
4. Read the name, address, email and phone number of a person through the keyboard and print the details.
5. Print the below triangle using for loop.

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

6. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
7. Python program to print all prime numbers in a given interval (use break)
8. Write a program to convert a list and tuple into arrays.
9. Write a program to find common values between two arrays.
10. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.
11. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.

12. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
13. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
14. The wordlist Iprovided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
15. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
16. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
17. Remove the given word in all the places in a string?
18. 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?
19. Writes a recursive function that generates all binarystrings of n-bit length
20. Write a python program that defines a matrix and prints
21. Write a python program to perform multiplication of two square matrices
22. 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.
23. Use the structure of exception handling all general-purpose exceptions.
24. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
25. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
26. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
27. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
28. Write a python code to read a phone number and email-id from the user and validate it for correctness.
29. Write a Python code to merge two given file contents into a third file.
30. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
31. Write a Python code to Read text from a text file, find the word with most number of occurrences
32. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
33. Import numpy, Plotpy and Scipy and explore their functionalities.
34. Install NumPypackage with pip and explore it.
35. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
36. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

**TEXT BOOKS:**

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

**REFERENCE BOOKS:**

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wileypublications
6. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech press
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press

# IT WORKSHOP

**B.Tech. II Semester** **L T P C**
**Subject Code: 25CS210ES** **0 0 2 1**

**Course Objectives:**

1. Understanding and working with PC hardware components.
2. Configuring and troubleshooting operating systems such as Windows and Linux.
3. Gaining basic networking skills and knowledge of Internet protocols.
4. Using productivity tools like MS Word, Excel, PowerPoint, and LaTeX for documentation and presentation.
5. Developing awareness of cybersecurity practices to ensure safe use of computer systems and the Internet.

**Course Outcomes:** After completion of this course, The Students will be able to:

1. Explore Assemble, disassemble, and troubleshoot PC hardware components effectively.
2. Demonstrate Install and configure multiple operating systems (Windows/Linux) on a single machine.
3. Relate a network connection, configure TCP/IP settings, and access web resources.
4. Construct technical documents and presentations using tools like MS Office and LaTeX.
5. Apply basic cybersecurity measures to protect systems from viruses, worms, and other threats.

**PC Hardware**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Task 2:** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Task 3:** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Internet & World Wide Web**

**Task1**: **Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Task 2: Web Browsers, Surfing the Web:** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

**Task 3**: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Task 4: Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

**LaTeX and WORD**

**Task 1 – Word Orientation**: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2: Using LaTeX and Word** to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Task 3: Creating project** abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Task 4: Creating a Newsletter**: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

**Excel**

**Excel Orientation:** The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler -** Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Task 2: Calculating GPA** - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**PowerPoint**

**Task 1:** Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

**Task 2:** Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

**Task 3:** Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**REFERENCE BOOKS:**

1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, Pearson Education.

**Akademi, Telangana Government in 2015.**

# PROBABILITYTHEORY AND STOCHASTIC PROCESSES

**B.Tech. IIISemester** **L T P C**
**Subject Code: 25EC301PC** **3 0 0 3**

**Pre-requisite:Mathematics**

**CourseObjectives:**

1. To give basic understanding on random experiments and random variables.
2. To know various moments about the origin and about the mean, to obtain moment generating functions.
3. To know the temporal characteristics of random processes.
4. To know the spectral characteristics of random processes.
5. To apply the knowledge of probability theoryto studynoise sources and information theory.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Define the concepts of probability, theorems, densityand distribution functions of various distributions.
2. Determine moments about the origin and central moments of random variables, know the significance of Central Limit Theorem.
3. Evaluate the temporal characteristics of Random processes.
4. Estimate the spectral characteristics of Random processes and characterize the response of linear systems to random signals.
5. Describe various noise sources in communication systems and acquire the knowledge of information theory.

**UNIT – I:** **[8 Lectures]**

**Introduction to Probability & the Concept of Random Variable:** Probability Definitions and Axioms, Random Experiments and Sample spaces, Events, Baye's Theorem and its proof, Random Variable - Definition, Conditions for a function to be a random variable, Distribution Function - Properties, Density Function - Properties. Vector Random Variables: Joint Distribution Function - Properties, Joint Density Function - Properties, Marginal Distribution and Density Functions, Statistical Independence.

**UNIT – II:** **[8 Lectures]**

**Operations on Single & Multiple Random Variables – Expectations:** Expected Value of a Random Variable, Moments about the origin: Mean, Mean Square Value, and Correlation. Central Moments: Variance, and Covariance. Moment Generating Function – Properties, Characteristic Function - Properties, Random Variable Distributions: Gaussian Distribution, Uniform Distribution, Binomial Distribution, and Poisson Distribution. Sum of Two Random Variables. Central Limit Theorem (Proof Not Expected). Linear Transformations of Gaussian Random Variables.

**UNIT – III:** **[8 Lectures]**

**Stochastic Processes – Temporal Characteristics:** The Stochastic Process Concept and definitions, Classification of Stochastic Processes, Stationarity, Wide Sense Stationarity, Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function -Properties, Cross Correlation Function - Properties, Gaussian Random Process, Poisson Random Process.

**UNIT – IV: [8 Lectures]**

**Stochastic Processes - Spectral Characteristics:** The power Density Spectrum, Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross- Power Density Spectrum, Properties, Relationship between Cross Power Density Spectrum and Cross-Correlation Function, Average Power of a Random Process.

**UNIT – V: [8 Lectures]**

**Noise Sources & Information Theory:** Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature and Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Mutual Information, **Source coding:** Huffman coding, Shannon Fano coding. Channel capacitytheorem.

**TEXT BOOKS:**

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

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 Sto- chastic Processes – McGraw Hill Education, 4th Edition
3. K. N. Hari Bhat, K. Anitha Sheela and Jayant Ganguly - Probability Theory and Stochastic Processes for Engineers - Pearson, 1st Edition, 2011
4. Taub and Schilling - Principles of Communication systems by(TMH), 2008
5. Y Mallikarjuna Reddy- Probability Theoryand Stochastic Processes, 4th Edition, Univer- sity Press

**WEB LINKS:**

# SIGNALSANDSYSTEMS

**B.Tech. III Semester** **L T P C**
**Subject Code: 25EC302PC** **3 0 0 3**

**Pre-requisite:Basic Electrical and Electronics Engineering**

**CourseObjectives:**

1. Classify signals and systems and their analysis in time domain.
2. Analyse the spectral characteristics of periodic and aperiodic signals using Fourier Series and Fourier Transform.
3. Analyse the concepts of distortion less transmission through LTI Systems, convolution and correlation properties.
4. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
5. Identify the need for sampling of CT signals, types and merits and demerits of each type.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Characterize various signals, systems and their time domain analysis.
2. Identify the spectral characteristics of periodic and aperiodic signals using Fourier Series and Transform.
3. Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
4. Understand and solve the differential equations using the Laplace and Z-Transform.
5. Understand the significance of sampling theorem for band limited signals for various types of sampling and for different duty cycles.

**UNIT – I:** **[8 Lectures]**

**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:** **[8 Lectures]**

**Fourier series:** Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series.

**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:** **[8 Lectures]**

**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 risetime.

**UNIT – IV:** **[8 Lectures]**

**Laplace Transforms:** Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of ROC, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of standard signals, Laplace Transform of certain signals using waveform synthesis.

**UNIT – V:** **[8 Lectures]**

**Sampling theorem:** Graphical and analytical proof of Sampling Theorem for Base band/Band Limited signals, Nyquist Rate and Nyquist Interval, Effect of under sampling – Aliasing, Types of Sampling: Impulse Sampling, Natural and Flattop Sampling, Reconstruction of signals from its samples.

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

**REFERENCE BOOKS:**

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

**WEB LINKS:**

1. **https://nptel.ac.in/courses/117101055**
2. **http://www.digimat.in/nptel/courses/video/108104100/L39.html**
3. **http://www.digimat.in/nptel/courses/video/111106139/L06.html**

# ELECTRONIC DEVICES AND CIRCUITS

**B.Tech. III Semester** **L T P C**
**Subject Code: 25EC303PC** **3 0 0 3**

**Pre-requisite: Basic knowledge of electrical circuits, semiconductor physics, and operation of diodes and transistors.**

**CourseObjectives:**

1. To understand the need for biasing in transistor circuits and various stabilization tech- niques.
2. To analyze small-signal models of BJT and FET amplifiers using h-parameters and other equivalent circuits.
3. To studythe operation, design, and frequency response of multistage amplifiers.
4. To comprehend the principles, types, and effects of feedback in amplifier design.
5. To learn the working principles of oscillators and advanced devices like FinFETs and CNTFETs.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Explain the necessityof transistor biasing and evaluate stabilization methods.
2. Analyze and design small-signal BJT and FET amplifiers for given specifications.
3. Compare different coupling methods in multistage amplifiers and assess their frequency response.
4. Applyfeedback concepts to improve amplifier performance and stability
5. Design and analyze oscillator circuits and compare advanced semiconductor device tech- nologies.

**UNIT – I:** **[8 Lectures]**

**Transistor Biasing and Stabilization:** Need for biasing, DC and AC load lines, operating point, fixed bias, collector to base bias, self-bias techniques for stabilization, stabilization factors (S, S',S''), Thermal runaway and thermal stability. Bias compensation using diodes, Thermistor and Sensistor compensation

**UNIT – II:** **[8 Lectures]**

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

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

**UNIT – III:** **[8 Lectures]**

**Multistage Amplifiers:** Classification of Amplifiers, Distortion in amplifiers, Different cou- pling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Casca RC Coupled amplifiers, Cascode amplifier, Darlington pair.

**UNIT – IV:** **[8 Lectures]**

**Feedback Amplifiers:** Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

**UNIT – V:** **[8 Lectures]**

**Oscillators:** Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**WEB LINKS:**

1. https://www.electronics-tutorials.ws/diode/diode_2.html
2. http://fourier.eng.hmc.edu/e84/lectures/ch4/node3.html
3. http://nptel.ac.in/courses/117103063/11 by Dr. Chitralekha Mahanta, IIT Guwahati.
4. https://www.youtube.com/watch?v=LdPcJIIvVfY IIT Roorkee

# DIGITALLOGICDESIGN

**B.Tech. III Semester** **L T P C**
**Subject Code: 25EC304PC** **3 0 0 3**

**Pre-requisite:Basic Electrical Engineering, Basic Electronics**

**CourseObjectives:**

1. To Compare common forms of number representation and Boolean algebra and minimiza- tion techniques to simplify Boolean functions.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems and their implementation using logic gates.
3. To Distinguish the concepts of combinational logic circuits and sequential circuits and se- quential circuit implementation using flip flops
4. To Realize programmable logic devices in digital system design.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Apply Boolean algebra and minimization techniques to simplify Boolean functions.
2. Design combinational circuits using logic gates.
3. Analyze latches and flip-flops to design sequential logic circuits.
4. Construct synchronous sequential circuits using flip-flops and logic gates.
5. Describe programmable logic devices in digital system design.

**UNIT – I:** **[8 Lectures]**
**Number Systems:** Binary, Octal, Decimal, Hexadecimal, Fixed-point and Floating-point Num- ber 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, Bool- ean Functions: Canonical and standard forms, Digital Logic Gates Overview.

**UNIT – II:** **[8 Lectures]**
**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:** **[8 Lectures]**
**Combinational Logic Circuits:** Analysis and design procedures, Binary adder-subtractor and BCD adder, magnitude comparator, decoders, encoders, multiplexers and demultiplexers.

**UNIT – IV:** **[8 Lectures]**
**Sequential Logic Circuits:** Gated latches, Flip-flops: Clocked S-R, D, T, JK, Master-Slave JK, Design of synchronous and asynchronous counters, Shift registers: types and applications.

**UNIT – V:** **[8 Lectures]**
**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.

**WEB LINKS:**

1. **https://www.youtube.com/watch?v=7Np_5Q-P8eo**
2. https://www.youtube.com/watch?v=sio7vaSBpyg
3. **https://www.youtube.com/watch?v=5MtwWJEqwKo**

# NETWORK ANALYSIS AND SYNTHESIS

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. III Semester** | | | | |
| **Subject Code: 25EC305ES** | **2** | **0** | **0** | **2** |

**Pre-requisite:Basic Electrical Engineering**

**CourseObjectives:**

1. To explain the basic concepts of RLC circuits, network theorems and it's frequencydo- main analysis.
2. To understand the basics of magnetic circuits and network topology.
3. To know the behavior of the steadystates and transient states in RLC circuits.
4. To studythe transfer function and network functions in S domain.
5. To Apply the two port network parameters.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Illustrate the circuit using various theorems and frequencydomain analysis of RLC series resonance circuit.
2. Analyze the knowledge of magnetic circuits and network topology.
3. Asses the Steadystate and transient states of RLC Circuits.
4. Interpret the network functions in S domain.
5. Design and analyze the knowledge of characteristics of the two port network parameters.

**UNIT – I: [8 Lectures]**

**Network Theorems (DC Circuits only):** Super position theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem.

**Frequency Domain Analysis:** Series and parallel Resonance - Resonance curves, Bandwidth, quality factor.

**UNIT – II: [8 Lectures]**

**Magnetic Circuits:** Self and Mutual inductances, co-efficient of coupling, dot convention, coupled circuits, equivalent T for Magnetically coupled circuits.

**Network Topology:** Definition, Incident matrix, loop matrix, Basic cut-set and tie set matrices for planar networks and network equilibrium equations.

**UNIT – III: [8 Lectures]**

**Transient and Steady State analysis**: RC, RL and RLC Circuits, Circuits with switches, step response, $2^{nd}$ order RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases.

**UNIT – IV: [8 Lectures]**

**Network Analysis using Laplace transform techniques** - RC, RL and RLC circuit response for step, impulse exponential excitation and periodic excitation.

**UNIT – V: [8 Lectures]**

**Two port network parameters: Z**, Y, ABCD, h and g parameters, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros.

**TEXT BOOKS:**

1. Van Valkenburg, Network Analysis, Pearson, 3rd Edition, 2016,.
2. William Hayt and Jack E Kemmerly, Engineering Circuit Analysis, MGH, 8th Edition,1993.

**REFERENCE BOOKS:**

1. J. Edminister and M. Nahvi, Electric Circuits, Schaum's Outlines, McGraw Hill Education, 7th Edition, 2017.
2. JD Ryder, Networks, Lines and Fields, PHI, 2nd Edition,1999.
3. Ravish R Singh, Network Analysis and Synthesis, McGraw Hill education, 1st Edition, 2017.

**Web Links:**

1. **https://nptel.ac.in/courses/108/105/108105159/ by Prof. Tapas Kumar Bhattacharya**
2. **http://ocw.mit.edu**
3. **www.allaboutcircuits.com**
4. **www.analyzethat.net**

# INNOVATION AND ENTREPRENEURSHIP

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. III Semester** | | | | |
| **Subject Code: 25MB306HS** | **1** | **0** | **0** | **1** |

**Pre-requisite:**

**CourseObjectives:**

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: After completion of this course, the studentswill be able to:**

1. Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.
2. Assess the problem from an industry perspective and generate solutions using the design thinking principles.
3. Assess market competition, estimate market size, and develop a prototype.
4. Analyze Business and financial planning models and Go-to-Market strategies.
5. Able to build a start-up, register IP and identify funding opportunities.

**UNIT – I:** **[6 Lectures]**

**Fundamentals of Innovation and Entrepreneurship:** Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors,
**Entrepreneurship:** Introduction, types of entrepreneurship attributes, Role of entrepreneurs in economic development. Woman Entrepreneurship,
**Core Teaching Tool:** Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

**UNIT – II:** **[6 Lectures]**

**Problem and Customer Identification**: Identification of gap, problem, analyzing the problem from a industry perspective, market and customer segmentation, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, , Design thinking principles, Mapping of solution to problem.
**Core Teaching Tool:** Several types of activities including: Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

**UNIT – III:** **[5 Lectures]**

**Opportunity assessment and Prototype development**: Identify and map global competitors, review industry trends. Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation.
**Core Teaching Tool:** Venture Activity, no-code Innovation tools, Class activity

**UNIT – IV:** **[6 Lectures]**

**Business & Financial Model:** Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model. Business planning: components of Business plan- Financial Planning: Types of costs, Go-To-Market (GTM) approach – Selecting the Right Channel, creating digital presence, and building customer acquisition strategy.

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

**UNIT – V:** **[6 Lectures]**

**Startups and IPR:** Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, 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, Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.

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

**TEXT BOOKS:**

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

# MODELLING AND SIMULATION LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. III Semester** | | | | |
| **Subject Code: 25EC307PC** | **0** | **0** | **2** | **1** |

**Co-requisite:Signals and Systems**

**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 completion of this course, the studentswill be able to:**

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 Dis- crete 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 the eigen values and eigen vector and to find the solution of a linear equation.
4. Will be able to use a simulation tool for generating different Random Signals; 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

**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 and Nonstandard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis.
2. Write the code / script to perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them. Also to find Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
3. Write the code / script for finding the output of a System for a given input and Impulse Response and finding Convolution and Correlation of Signals / sequences
4. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant, Stable and Physically Realizable
5. Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.
   a) Plot the Real and Imaginarypart and
   b) Magnitude and Phase Plot of the response
6. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.
7. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever required. Also plot pole-zero diagram in S-plane
8. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform byusing the properties wherever required. Also plot pole – zero diagram in Z-plane

9. Design a Simulink or equivalent model for
   c) Solving Differential Equations
   d) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses
10. Write the code/ script for finding real and complex Eigen values and Eigen vectors.

**Probability Theory and Stochastic Processes (Minimum 3 Experiments)**

1. Write the code / script for generating various Random Variables with different CDFs/ PDFs
2. Write the code / script for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
3. Write the code / script for Verifying Sampling theorem for different sampling rates, Sam- pling types and Duty Cycles and for plotting the sampled and reconstructed Signals.
4. Write the code / script for Removal of noise from the signal using Cross correlation.
5. Write the code / script to find the Solution of given system of linear equations using Jacobi's iteration method and Gauss-Seidal iteration method

**Control Systems (Minimum 2 Experiments)**

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

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

**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.math-works.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 alias- ing. For steps, go through the following page:

   https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html

# ELECTRONIC DEVICES AND CIRCUITS LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. III Semester** | | | | |
| **Subject Code: 25EC308PC** | **0** | **0** | **2** | **1** |

**Co-requisite:** Basic Electrical and Electronics Engineering Lab

**Course Outcomes: After completion of this course, students will be able to:**

1. Understand and analyze the DC biasing techniques of BJT amplifiers to establish a stable operating point using both fixed bias and voltage divider bias methods.
2. Demonstrate the ability to construct and evaluate the frequency response characteristics of various amplifier configurations such as Common Emitter, Common Source, Emitter Follower and multi-stage amplifiers.
3. Design and analyze single-stage feedback amplifier circuits such as current shunt and voltage series feedback configurations to understand their impact on gain, bandwidth, and stability.
4. Construct and evaluate multi-stage amplifier circuits, including RC coupled amplifiers and Darlington pair configurations, to study cumulative gain, impedance characteristics, and frequency response.
5. Design and verifythe performance of oscillator circuits including RC Phase Shift, Hartley, and Colpitts oscillators based on the conditions for sustained oscillations.

**Perform any twele experiments ( pick any 6 experiments from each section)**

**Hardware Experiments:**

1. Design and Analysis of Fixed Bias and Voltage Divider Bias Circuits for BJT – DC Load Line and Q-Point Stabilization
2. Experimental Verification of Frequency Response in a Common Emitter BJT Amplifier
3. Frequency Response Analysis of Common Source JFET Amplifier
4. Frequency Response Study of a Two-Stage RC Coupled Amplifier
5. Demonstration of High Input Impedance in a Darlington Pair Configuration
6. Design and Testing of a Current Shunt Feedback Amplifier
7. Implementation and Analysis of a Voltage Series Feedback Amplifier
8. Design and Testing of an RC Phase Shift Oscillator
9. Construction and Analysis of Hartley and Colpitts Oscillator Circuits

**Software Experiments:**

1. Simulation of Frequency Response in a Common Emitter Amplifier
2. Simulation and Analysis of Frequency Response in an Emitter Follower Circuit
3. Frequency Response Simulation of a Common Source JFET Amplifier
4. Simulation of Frequency Response in a Two-Stage RC Coupled Amplifier
5. Design and Simulation of a Current Shunt Feedback Amplifier
6. Simulation and Analysis of a Voltage Series Feedback Amplifier
7. RC Phase Shift Oscillator Simulation and Performance Study
8. Simulation of a Cascode Amplifier for High Gain Applications
9. Design and Simulation of a Darlington Pair Amplifier Circuit

**Hardware Equipment required**:

1. Regulated Power Suppliers,0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multi meters, Electronic Components

**Simulation Tools:**

LTspice / Multisim / PSpice / Proteus / NI Multisim Live or equivalent Operating System: Windows 10/11 or Linux (Ubuntu preferred)

# DIGITAL LOGIC DESIGN LAB

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. III Semester** | | | | |
| **Subject Code: 25EC309PC** | **0** | **0** | **2** | **1** |

**Co-requisite: Digital Logic Design**

**Course Outcomes: After completion of 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. Design digital systems in Verilog HDL using dataflow, behavioral, and structural styles.
4. Design and verify digital systems using industry-standard EDA tools and testbenches.
5. Analyze modular and hierarchical designs such as counters, FSMs, and shift registers.

**List of Experiments:** ***Perform any twelve 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 Binaryto Gray, Grayto 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 dataflow modeling; extend it to 4-bit using structural modeling.
2. Implement a 2:1 multiplexer using dataflow modeling and design an 8:1 multiplexer using structural modeling.
3. Design a 2-to-4 decoder using dataflow 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 behavioral modeling.
6. Design a synchronous MOD-n counter using behavioral 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 behavioral modeling.

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

| Component | Description |
|---|---|
| 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 |

**Required Software Tools (for Verilog HDL Experiments) (Any one of the tool below)**

| Software | Purpose |
|---|---|
| Xilinx Vivado | HDLsimulation and synthesis (preferred tool) |
| ModelSim | Verilog simulation and waveform analysis |
| Xilinx ISE | Legacy support for simulation and FPGA design |

# LINUX AND SHELL SCRIPTING

**B. Tech III Semester** **L T P C**
**Subject Code: 25EC310SD** **0 0 2 1**

**Co-requisite: Digital Logic Design**

**Course Outcomes: After completion of this course, students 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.

**Week 1: Introduction to OS Concepts**
**Lab Activity:** Linux History, Opensource software basics & Licenses, Why Linux vs windows Identify

**Week 2: Linux Architecture & Kernel Types**
**Lab Activity:** Compare Monolithic and Microkernel architectures using diagrams. Discuss how Linux's

**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: Package Management & Archiving**
**Use Case:** Setting Up Developer Environment + Archiving a Project
**Lab Activity:**
Use apt (Ubuntu) or yum (CentOS) to install essential tools like vim, curl, or git. Archive a project directory using tar or zip. Use sha256sum to verify archive integrity before transferring it to another system.
Installation of applications using apt, apt-get, yum, dnf, snap, or brew commands. Setup python virtual Environment

**Week 12: 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, traceroute, netstat, nbtstat, 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 13: Service Management & Disk Mounting**
**Use Case:** Adding Extra Storage Without Reboot
**Lab Activity:**
Create a new virtual disk in VirtualBox. 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 14: 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 15: 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.

**Week 16: Final Demo & Viva**
**Use Case:** Present Your Solution to the Faculty Team

**Lab Activity:**
Demonstrate your mini project. Explain your code, how it solves the problem, test cases handled, and improvements you'd make. Submit your code with screenshots, logs, and a short user manual or README

# ENVIRONMENTAL SCIENCE

**B.Tech. III Semester** **L T P C**
**Subject Code: 25CH311VA** **1 0 0 1**

**Pre-requisite: Nil**

**CourseObjectives:**

1. To recognize the importance of environment, self-sustain eco systems.
2. To understand various natural resources – their importance, over exploitation, effects, and mitigation measures.
3. To create basic knowledge about different biotic resources and their need for conservation.
4. To be aware of the impacts of developmental activities and mitigation measures.
5. To know various environmental policies, legislation, and regulations.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Explore harmonious co-existence of nature and human beings.
2. Recognize conservation of natural resources particularly alternate sources of energy.
3. Evaluate and develop technologies for conservation of biodiversityin a sustainable man- ner.
4. Generate ideas and implement technologies to solve environmental problems associated with air, water, and soil.
5. Develop technologies based on ecological principles and environmental regulations which helps in sustainable developments

**UNIT – I:** **[8 Lectures]**

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

**UNIT – II:** **[8 Lectures]**

**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:** **[8 Lectures]**

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

**UNIT – IV:** **[8 Lectures]**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution.

**Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards.

**Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise**

**Pollution:** Sources and Health hazards, standards,

**Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management.

**Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation.

**Global Environmental Problems and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol.

**UNIT – V: [8 Lectures]**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects AirAct-1981, Water Act, Forest Act, Wildlife 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). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon lifestyle.

**TEXT BOOKS:**

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

**REFERENCE BOOKS:**

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

**Web Links:**

1. https://www.youtube.com/watch?v=mOwyPENHhbc
2. https://www.youtube.com/watch?v=_mgvsPnCYj4
3. https://www.youtube.com/watch?v=L5B-JMnBIyQ

# NUMERICALMETHODS AND COMPLEX VARIABLES

**B.Tech. IVSemester** **L T P C**
**Subject Code: 25MA401BS** **2 0 0 2**

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

**CourseObjectives:**

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

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Express any periodic function in terms of sine and cosine.
2. Find the root of a given polynomial and Estimate the value for the given data using interpolation
3. Find the numerical solutions for a given first order ODE's
4. Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
5. Taylor's and Laurent's series expansions in complex function.

**UNIT – I:** **[8 Lectures]**
**Fourier Series & Fourier Transforms:** Fourier series – Dirichlet's Conditions – Half-range Fourier series – Fourier Transforms: Fourier Integral Theorem (Only statements), Fourier Sine and Cosine transforms (Elementary illustrations)

**UNIT – II:** **[10 Lectures]**
**Numerical Methods-I:** Solution of polynomial and transcendental equations: Bisection method – Iteration Method – Newton-Raphson method and Regula-Falsi method. Finite differences: forward differences – backward differences – Interpolation using Newton's forward and backward difference formulae – Lagrange's method of interpolation.

**UNIT – III:** **[10 Lectures]**
**Numerical Methods-II:** Numerical integration: Trapezoidal rule - Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

**Ordinary differential equations:** Taylor's series – Euler's method – Runge-Kutta method of fourth order for first order ODE.

**UNIT – IV:** **[10 Lectures]**
**Complex Differentiation:** Differentiation of Complex functions – Analyticity – Cauchy-Riemann equations (without proof) – Harmonic Functions – Finding harmonic conjugate – Milne-Thomson method.

**UNIT – V:** **[10 Lectures]**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**Web Links:**

# ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

**B.Tech. IV Semester** **L T P C**
**Subject Code: 25EC402PC** **3 0 0 3**

**Pre-requisite: Applied Physics**

**Course Objectives:**

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields, and apply them to solve physics and engineering problems.
2. To 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.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

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

1. Learn and Evaluate the problems of electrostatic fields.
2. Solve the problems of magneto static fields and boundary condition using Maxwell's equations.
3. Apply the concept of electromagnetic wave propagation in different media.
4. Evaluate the concept of transmission lines and their applications.
5. Design and analyze various impedance matching techniques.

**UNIT – I:** **[8 Lectures]**

**Electrostatics:** Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two 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, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors.

**UNIT – II:** **[10 Lectures]**

**Magneto statics:** Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

**Maxwell's Equations (Time Varying Fields):** Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

**UNIT – III:** **[8 Lectures]**

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

**UNIT – IV: [8 Lectures]**

**Transmission Lines - I:** Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

**UNIT – V: [8 Lectures]**

**Transmission Lines – II:** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

**TEXT BOOKS:**

1. Matthew N.O. sadiku and S.V. Kulkarni, Principles of Electromagnetics, Oxford University Press, Asian Edition, 6th Edition, 2015.
2. E.C. Jordan and K.G. Balmain, Electromagnetic Waves and Radiating Systems, PHI, 2nd Edition, 2000.
3. Umesh Sinha, Satya Prakashan, Transmission Lines and Networks, (Tech. India Publications), New Delhi, 2001.

**REFERENCE BOOKS:**

1. William H. Hayt Jr. and John A. Buck, Engineering Electromagnetics McGrawHill, 8th Edi- tion 2014.
2. Nathan Ida, Engineering Electromagnetics, Springer (India) Pvt. Ltd, New Delhi 2nd Edition,2005.
3. G.Sashibhushana Rao, Electromagnetic field theory and transmission lines, Wiley India, 2nd Edition, 2012.
4. JD Ryder, Networks, Lines and Fields, PHI, 2nd edition, 1999.

**WEB LINKS:**

1. https://nptel.ac.in/courses/108106157NPTEL Course on “Transmission lines and electromagnetic waves”,IIT Madras, Dr. Ananth Krishnan.
2. https://nptel.ac.in/courses/117101056NPTEL Course on “Transmission Lines and EM Waves”, IIT Bombay, Prof. R.K. Shevgaonkar.
3. https://nptel.ac.in/courses/117103065 NPTEL Course on “Electromagnetic fields” , IIT Guwahati, Dr.Ratnajit Bhattacharjee.

# ANALOG AND DIGITAL COMMUNICATIONS

**B.Tech. IV Semester** **L T P C**
**Subject Code: 25EC403PC** **3 0 0 3**

**Pre-requisite: Probability theory and Stochastic Processes**

**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. Use PCM, DPCM, DM, and ADM techniques to represent and reconstruct digital signals.
5. To understand the probability of error in ASK, FSK, PSK, QPSK, DPSK, and QAM systems and the concepts of base band transmissions.

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

1. Illustrates of various Amplitude modulation and demodulation techniques.
2. Explain various angle modulation and demodulation techniques
3. Acquire the knowledge about AM, FM Transmitters and Receivers
4. Evaluate the various Pulse Modulation Techniques.
5. Distinguish the concepts of Digital Modulation Techniques and Baseband transmission.

**UNIT – I:** **[8 Lectures]**

**Amplitude Modulation:** Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

**UNIT – II:** **[10 Lectures]**

**Angle Modulation:** Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

**UNIT – III:** **[8 Lectures]**

**Transmitters:** Classification of Transmitters, AM Transmitters, FM Transmitters

**Receivers:** Radio Receiver - Receiver Types - Tuned radio frequency receiver, super heterodyne receiver, Intermediate frequency, Image frequency, AGC, Comparison of AM and FM Receivers.

**Pulse Modulation:** Types of Pulse modulation-PAM, PWM and PPM. Comparison of FDM and TDM.

**UNIT – IV:** **[8 Lectures]**

**Pulse Code Modulation:** PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

**UNIT – V:** **[8 Lectures]**

**Digital Modulation Techniques:** ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non- Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM, Probability of Error.

**Baseband Transmission of Digital Signal:** A Baseband Signal Receiver, ISI, Eye Diagrams.

**TEXT BOOKS:**

1. Simon Haykin, An Introduction to Analog and Digital Communications, John Wiley, 2nd Edition, 2015.
2. Wayne Tomasi, Electronics Communication Systems-Fundamentals through Advanced, PHI, 5th Edition, 2009.

**REFERENCE BOOKS:**

1. Herbert Taub, Donald LSchilling, Goutam Saha, Principles of Communication Systems, McGraw-Hill, 3rd Edition, 2008,.
2. Dennis Roddy and John Coolean, Electronic Communications, PEA, 4th Edition, 2004,.
3. George Kennedy and Bernard Davis, Electronics & Communication System, TMH, 5th Edition, 2011.
4. K. Sam Shanmugam, Digital and Analog Communication Systems, Wiley India Pvt Ltd, . 1st Edition, 2017.

**WEB LINKS:**

1. http://nptel.ac.in/courses/117102059/ Prof. Surendra Prasad.
2. https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSys- tems-4ed-Haykin.pdf.
3. http://bayanbox.ir/view/914409083519889086/Book-Modern-Digital-And-AnalogCommunication- Systems-4th-edition-by-Lathi.pdf.
4. https://soaneemrana.org/onewebmedia/ELECTRONICS%20COMMUNICATION%20SYSTEM%20BY%20GEORGE%20KENNEDY.pdf

# ELECTRONIC AND PULSE CIRCUITS

**B.Tech. IV Semester** **L T P C**
**Subject Code: 25EC404PC** **3 0 0 3**

**Pre-requisite: Electronic devices Circuits, Basics of Mathematics, Physics.**

**Course Objectives:**

1. To understand high-frequency transistor modeling using the hybrid-π model and analyze gain– bandwidth performance.
2. To study the operation, classification, and design of large-signal and tuned amplifiers for high-efficiency applications.
3. To analyze and design linear and non-linear wave-shaping circuits for signal modification and conditioning.
4. To learn the design and operation of various multivibrator circuits and Schmitt triggers using transistors.
5. To understand the principles, design methods, and linearityimprovement techniques of time base generators.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Analyze high-frequency transistor models and evaluate amplifier performance considering gain– bandwidth limitations.
2. Design and compare large-signal amplifier classes and tuned amplifiers for specified frequency responses.
3. Design and evaluate RC-based wave-shaping circuits, clippers, and clampers for desired signal processing.
4. Develop and implement bistable, monostable, astable multivibrators, and Schmitt triggers using transistor circuits.
5. Design and implement time base generators with improved linearity for waveform generation applications

**UNIT – I:** **[8 Lectures]**

**High-Frequency Transistor Model:** The Hybrid-pi (π) Common-Emitter Transistor Model, Hybrid-π conductances and Hybrid-π capacitances, The CE Short-Circuit Current Gain Obtained with the Hybrid-pi Model, Current Gain with Resistive Load , Transistor Amplifier Response, Taking Source Resistance into Account and gain-bandwidth product.

**UNIT – II:** **[8 Lectures]**

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

**Tuned Amplifiers:** Introduction, Single Tuned Amplifier-Quality factor, frequency response of tuned amplifier, Concepts of Stagger Tuned and Synchronous Tuning.

**UNIT – III:** **[8 Lectures]**

**Linear and Non-Linear Wave Shaping:** Responses of RC-high pass circuit and low pass circuits to sinusoidal and square inputs, RC circuit as a differentiator and integrator, clipping circuits with diodes, clipping at two independent levels, transfer characteristics of clippers, clampers, clamping circuit theorem, practical clamping circuits.

**UNIT – IV:** **[8 Lectures]**

**Multivibrators:** Classification of Multivibrators, Bistable multivibrator, commutating capacitors, triggering, binary-symmetrical & unsymmetrical triggering, Schmitt Trigger circuit. Monostable multivibrators- collector coupled, emitter coupled, Triggering monostable. Astable Multivibrators - collector coupled and emitter coupled using transistors.

**UNIT – V:** **[8 Lectures]**

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

**TEXT BOOKS:**

1. Jacob Millman, Christos Halkias, Integrated Electronics, McGraw Hill Education, 2nd Edition, 2017.
2. Thomas L. Floyd 2015, Electronic Devices Conventional and current version, Pearson.
3. Jacob Millman, Herbert Taub, 3rd Edition, Pulse, Digital and Switching Waveforms, McGraw Hill.

**REFERENCE BOOKS:**

1. David A.Bell, Pulse, Switching and Digital Circuits, Oxford University Press, 5th Edition, 2015.
2. David A. Bell, Electronic Devices and Circuits, Oxford University Press, 5th Edition, 2015.
3. Robert L. Boylestead, Louis Nashelsky, Electronic Devices and Circuits Theory, Pearson, 11th Edition, 2009.
4. Saliva Hanan, Electronic Devices and Circuits, PHI, 3rd Edition, 2012.

**Web Links:**

1. https://onlinecourses.nptel.ac.in/noc21_ee89/preview by By Prof. Shouribrata Chatterjee, IIT, Delhi.
2. https://nptel.ac.in/courses/108/102/108102095 by Prof. S.C.Dutta Roy, IIT, Delhi.
3. http://www.iitg.ac.in/apvajpeyi/ph218.html

# LINEARAND DIGITAL IC APPLICATIONS

**B.Tech. IVSemester** **L T P C**
**Subject Code: 25EC405PC** **3 0 0 3**

**Pre-requisite:Electronic devices Circuits**

**CourseObjectives:**

1. To Understand basic Op-AMP working and Applications
2. To study the timers and PLL applications
3. To understand the data converters-ADC and DAC
4. To understand the concepts of Digital IC's
5. To introduce some special function ICs for Sequential logic and Memories

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Explore the operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and design applications of IC555 and IC565.
3. Acquire the knowledge and design the Data converters.
4. Analyze the different families of digital integrated circuits and their characteristics.
5. Choose the proper digital integrated circuits by knowing their characteristics

**UNIT – I:** **[8 Lectures]**

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

**UNIT – II:** **[8 Lectures]**

**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:** **[8 Lectures]**

**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:** **[8 Lectures]**

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

**UNIT – V:** **[8 Lectures]**

**Sequential Logic IC's and Memories:** Familiarity with commonly available 74XX & CMOS40XX Series ICs - All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**Web Links:**

1. https://www.nptel.ac.in
2. https://www.svecw.edu.in
3. https://www.smartzworld.com
4. https://www.crectirupati.com http:// web.stanford.edu/class

# COMPUTATIONAL MATHEMATICS LAB

| B.Tech. IV Semester | L | T | P | C |
|---|---|---|---|---|
| Subject Code: 25MA406BS | 0 | 0 | 2 | 1 |

**Co-requisite: Matrices, Iterative methods and ordinary differential equations**

**Course Objectives:**

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

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

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

*** Visualize all solutions Graphically through programs**

**UNIT-I: Eigen values and Eigenvectors: 6P**

**Programs:**

- Finding real and complex Eigen values.
- Finding Eigen vectors.

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

**UNIT-IV: First-Order ODEs 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

# CONTROL SYSTEMS

**B.Tech. IV Semester** **L T P C**
**Subject Code: 25EC407PC** **2 0 0 2**

**Pre-requisite: Linear Algebra and Calculus, Ordinary Differential Equations and Multivariable Calculus Laplace Transforms, Numerical Methods and Complex variables**

**Course Objectives:**

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving.
3. To assess the system performance using frequency domain analysis and techniques for improving the performance.
4. To design various controllers and compensators to improve system performance.
5. To provide a systematic understanding of modern control system analysis using the state-space approach.

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

1. Analyze the modeling of linear-time-invariant systems using transfer function.
2. Apply the concept of stability and Analyze stability for linear-time invariant systems in Time domain.
3. Make use of the concept of Frequency domain representation and Analyze Stability in Frequency domain
4. Identify the needs of different types of controllers and design of PID controllers
5. Analyze Concepts of State space models.

**UNIT – I:** **[8 Lectures]**

**Mathematical modelling of physical systems:** Open – loop and Closed loop Systems, Concept of Feedback Control, Benefits of Feedback and Effects of feedback, Linear, Non-Linear, Time Variant and Time Invariant systems, Mechanical and Electrical Systems. Transfer function, Block-Diagram Techniques.

**UNIT – II:** **[8 Lectures]**

**Time Response Analysis of Standard Test Signals:** Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second- order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

**UNIT – III:** **[8 Lectures]**

**Frequency-Response Analysis:** Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion–gain and phase margin. Closed-loop frequency response.

**UNIT – IV:** **[8 Lectures]**

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

**UNIT – V:** **[8 Lectures]**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**Web Links:**

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

# ANALOG AND DIGITAL COMMUNICATIONS LAB

| | | | | |
|---|---|---|---|---|
| **B.Tech. IV Semester** | **L** | **T** | **P** | **C** |
| **Subject Code: 25EC408PC** | **0** | **0** | **2** | **1** |

**Co-requisite: Analog and Digital Communications**

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

1. Examine different AM and FM Modulation & Demodulation Technique using appropriate experimentation setup.
2. Design Multiplexing and De - Multiplexing Techniques using appropriate experimentation setup.
3. Distinguish different Pulse Modulation Techniques using appropriate experimentation setup.
4. Create and analyze different Shift Keying Techniques using appropriate experimentation setup.
5. Build and analyze Quadrature Shift Keying Techniques using appropriate experimentation setup.

**Note:**

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

**List of Experiments:**

1. Generate Amplitude modulated Signal and perform demodulation for different modulation in- dices. 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 in- dices. 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 modu- lation indices and plot the corresponding waveforms and their spectrum. Also calculate theoret- ically and practically the modulation index in each case
5. Demonstrate the Frequency Division Multiplexing & De multiplexing practically by transmit- ting at least 4 different signals simultaneously with respect to time and recovering without dis- tortion.
6. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
7. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
8. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
9. Generate PCM Modulated Signal and demodulate it by designing and implementing the corre- sponding Demodulator. Plot the corresponding waveforms from practical observations

10. Generate Delta Modulated Signal and demodulate it by designing and implementing the corre- sponding Demodulator. Plot the corresponding waveforms from practical observations.
11. Generate FSK modulated Signal and demodulate it by designing and implementing the corre- sponding Demodulator. Plot the corresponding waveforms from practical observations.
12. Generate practically Binary PSK modulated Signal and demodulate it by designing and imple- menting the corresponding Demodulator. Plot the corresponding waveforms from practical ob- servations.
13. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
14. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
15. Plot Signal Constellation for BPSK, BFSK and QPSK
16. Analyze the performance of BPSK, BFSK and QPSK under noisy environment through constel- lation diagram
17. Simulate raised cosine signal and duo binarysignals
18. Analyze the performance of a Matched Filter.

**Major Equipments Required for Laboratories:**

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. Trainer Kits

# ELECTRONIC AND PULSE CIRCUITS LAB

**B.Tech. IVSemester** **L T P C**
**Subject Code: 25EC409PC** **0 0 2 1**

**Co-requisite:Electronics and Pulse Circuits**

**Course Objectives (COs):**

1. To studythe design, operation, and performance of different classes of power amplifiers.
2. To analyze clipping, clamping, and waveform shaping circuits.
3. To design and test multivibrators (bistable, monostable, astable) using BJTs.
4. To simulate and verifyamplifier responses and crossover distortion elimination.
5. To simulate special circuits like Schmitt trigger, bootstrap time-base generator, and tuned amplifier for waveform and frequency response analysis.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Design and analyze Class A and Class B amplifiers and studycrossover distortion.
2. Implement and evaluate clipping and clamping circuits at various reference voltages.
3. Design, test, and simulate multivibrator circuits to observe input/output waveforms.
4. Simulate Schmitt trigger and bootstrap circuits to analyze hysteresis and sweep waveforms.
5. Simulate tuned amplifiers to determine frequency response and quality factor.

**Note:**

- Minimum 12 experiments should be conducted:

**List of Hardware Experiments:**

1. Design and Analysis of a Class A Power Amplifier
2. Implementation of Class B Complementary Symmetry Power Amplifier and Studyof Crossover Distortion
3. Realization of Clipping Circuits at Various Reference Voltages
4. Implementation of Clamping Circuits at Various Reference Voltages
5. Design and Testing of a Bistable Multivibrator Using Discrete Components
6. Design and Testing of a Monostable Multivibrator Using Transistors
7. Design and Testing of an Astable Multivibrator Using BJT

**List of software experiments**

1. Simulation and Analysis of a Monostable Multivibrator – Input/Output Waveform Observation
2. Simulation and Analysis of a Bistable Multivibrator – Input/Output Characteristics
3. Simulation of a Schmitt Trigger Circuit for Varying Gain Values – Analysis of Hysteresis Behavior
4. Simulation of a Bootstrap Time Base Generator Using BJT – Sweep Waveform Analysis
5. Simulation and Frequency Response Verification of a Class A Power Amplifier
6. Simulation and Analysis of a Complementary Symmetry Push-Pull Amplifier – Studyof Crossover Distortion Elimination
7. Simulation and Analysis of a Single Tuned Amplifier – Determination of Quality Factor (Q)

**Hardware Equipment required:**

1. Regulated Power Suppliers,0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multi meters, Electronic Components

**Simulation Tools:**

LTspice / Multisim/ PSpice / Proteus / NI Multisim Live or equivalent Operating System: Windows 10/11 or Linux (Ubuntu preferred)

# WEB AND MOBILE APPLICATIONS

| | L | T | P | C |
|---|---|---|---|---|
| **B.Tech. IVSemester** | | | | |
| **Subject Code: 25EC410SD** | **0** | **0** | **2** | **1** |

**Course Outcomes: After completion of this course, the studentswill be ableto:**

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.

**Week-by-Week Syllabus**

**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: 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 8: Basic Server Concepts & Node.js**
Set up a basic Node.js server to serve web content. Understand server-side fundamentals and simple routing.

**Week 9: Introduction to Databases**
Learn to store and retrieve data using JSON or SQLite. Save contact form submissions from your portfolio into a database.

**Week 10: Introduction to Flutter**
Understand Flutter's widget structure and framework basics. Design a simple login and landing page for a mobile app.

**Week 11: Mobile App Interactivity**
Create a Flutter app that displays a list of events. Add RSVP functionality with confirmation messages.

**Week 12: Full-Stack Integration**
Build a registration page that saves new members to a database and displays a welcome message. Connect your Flutter app to a database for data-driven functionality.

**Week 13: 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 14: 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).

# GENDER SENSITIZATION LAB

**B.Tech. IV Semester** **L T P C**
**Subject Code: 25EN411VA** **1 0 0 1**

**Course Objectives:**

1. To develop students' sensibilitywith regard to issues of gender in contemporary India.
2. To introduce students to information about some key biological aspects of genders.
3. To expose the students to debates on the politics and economics of work.
4. To help students reflect critically on gender violence.
5. To expose students to more egalitarian interactions between men and women.

**Course Outcomes: After completion of this course, the studentswill be able to:**

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
3. Students will acquire insight into the gendered division of labour and its relation to politics and eco- nomics.
4. Men and women students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life.

**UNIT – I:** **[8 Lectures]**

**Understanding Gender: Introduction:** Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

**UNIT – II:** **[8 Lectures]**

**Gender Roles and Relations:** Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

**UNIT – III:** **[8 Lectures]**

**Gender and Labour:** Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

**UNIT – IV:** **[8 Lectures]**

**Gender - Based Violence:** The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

**UNIT – V:** **[8 Lectures]**

**Gender and Culture:** Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together

as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks The Brave Heart

**TEXT BOOK:**

1. Writers: A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu
   Published by: Telugu Academy, Telangana Government Year: 2015

**REFERENCE BOOK:**

1. Dr Rajpal Singh, Dr Anupama Sihag, Gender Sensitization: Issues and Challenges, Raj Publica- tions 2019.

**Web Links:**

1. http://ncw.nic.in/sites/default/files/Booklet-%20Gender%20Sensitization_0.pdf
2. 2.http://gmmrcg.in/Content/284_464_7.1.1%20weblink%20annual%20gender%20sensitiza-tion%20ac- tion%20plan.pdf

# LINEARAND DIGITAL IC APPLICATIONS LAB

**B.Tech. IVSemester** **L T P C**
**Subject Code: 25EC412PC** **0 0 2 1**

**Co-requisite:Linear and Digital IC Applications**

**Course Outcomes: Aftercompletion of this course, the students will be able to:**

1. Design and implementation of various analog circuits using 741 ICs.
2. Design and implementation of various Multivibrators using 555 timer
3. Design and implement various circuits using digital ICs
4. Design and implement ADC, DAC and voltage regulators.

**Note:**

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

**List of Experiments:**

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verifyaddition and subtraction process.
3. Design a Comparator using Op-Amp and draw the comparison results of A=B, A<B, A>B.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequencyof 2 KHz and find the roll off of it.
6. Design a Circuit using IC741 to generate sine / square / triangular wave with period of 1 KHz and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequencymodulator and demodulator circuit and draw the respective waveforms.
11. Design Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type / counter type / successive approximation ADC and find its efficiency.
14. Design a Graycode converter and verifyits truth table.
15. Design an even priorityencoder using IC74xx and verifyits truth table.
16. Design a 8x1multiplexer using digital ICs.
17. Design a 4-bit Adder / Subtractor using digital ICs and Add / Sub the following bits.
    (i) 1010 (ii) 0101 (iii) 1011
    0100 0010 1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design a Up/downcounterusingIC74163anddrawread/write waveforms.
20. Design a 8 bit parallel load and serial out shift register
21. Design a 16x4 RAM using 74189 and draw its read /write operation.
22. Design a 8x3 encoder / 3x8 decoder and verifyits truth table.

**Major Equipments Required for Laboratories:**

1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. Trainer Kits