## ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE STRUCTURE – VR24

### I B.Tech. – I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | MA101BS | Matrices and Calculus | 3 | 1 | 0 | 4 |
| 2 | PH102BS | Applied Physics | 3 | 1 | 0 | 4 |
| 3 | DS103ES | C Programming for Engineers | 3 | 0 | 0 | 3 |
| 4 | ME104ES | Engineering Workshop | 0 | 1 | 3 | 2.5 |
| 5 | EN105HS | English for Skill Enhancement | 2 | 0 | 0 | 2 |
| 6 | EC106ES | Elements of Electronics and Communication Engineering | 0 | 0 | 2 | 1 |
| 7 | PH107BS | Applied Physics Laboratory | 0 | 0 | 3 | 1.5 |
| 8 | DS108ES | C Programming for Engineers Laboratory | 0 | 0 | 2 | 1 |
| 9 | EN109HS | English Language and Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 10 | MC110 | Environmental Science | 3 | 0 | 0 | 0 |
| | | **Total** | **14** | **3** | **12** | **20** |

### I B.Tech. - II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | MA201BS | Ordinary Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 |
| 2 | CH202BS | Engineering Chemistry | 3 | 1 | 0 | 4 |
| 3 | ME203ES | Computer Aided Engineering Graphics | 1 | 0 | 4 | 3 |
| 4 | EE204ES | Basic Electrical Engineering | 2 | 0 | 0 | 2 |
| 5 | EC205ES | Electronic Devices and Circuits | 2 | 0 | 0 | 2 |
| 6 | EC206ES | Electronic Devices and Circuits Laboratory | 0 | 0 | 2 | 1 |
| 7 | CH207BS | Engineering Chemistry Laboratory | 0 | 0 | 2 | 1 |
| 8 | EE208ES | Basic Electrical Engineering Laboratory | 0 | 0 | 2 | 1 |
| 9 | ML209ES | Applied Python Programming Laboratory | 0 | 1 | 2 | 2 |
| | | **Total** | **11** | **3** | **12** | **20** |

**Note:**      **L - Theory**      **T - Tutorial**      **P - Practical**

## II B.Tech. – I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | MA301BS | Numerical Methods and Complex Variables | 3 | 1 | 0 | 4 |
| 2 | EC302PC | Analog Circuits | 3 | 0 | 0 | 3 |
| 3 | EC303PC | Network analysis and Synthesis | 3 | 0 | 0 | 3 |
| 4 | EC304PC | Digital Logic Design | 3 | 0 | 0 | 3 |
| 5 | EC305PC | Signals and Systems | 3 | 1 | 0 | 4 |
| 6 | EC306PC | Analog Circuits Laboratory | 0 | 0 | 2 | 1 |
| 7 | EC307PC | Digital logic Design Laboratory | 0 | 0 | 2 | 1 |
| 8 | EC308PC | Basic Simulation Laboratory | 0 | 0 | 2 | 1 |
| 9 | *MC309 | Constitution of India | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **2** | **6** | **20** |

## II B.Tech. - II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC401PC | Probability Theory and Stochastic Processes | 3 | 0 | 0 | 3 |
| 2 | EC402PC | Electromagnetic Fields and Transmission Lines | 3 | 0 | 0 | 3 |
| 3 | EC403PC | Analog and Digital Communications | 3 | 0 | 0 | 3 |
| 4 | EC404PC | Linear and Digital IC Applications | 3 | 0 | 0 | 3 |
| 5 | EC405PC | Electronic Circuit Analysis | 3 | 0 | 0 | 3 |
| 6 | EC406PC | Analog and Digital Communications Laboratory | 0 | 0 | 2 | 1 |
| 7 | EC407PC | Linear and Digital IC Applications Laboratory | 0 | 0 | 2 | 1 |
| 8 | EC408PC | Electronic Circuit Analysis Laboratory | 0 | 0 | 2 | 1 |
| 9 | EC409PC | Real Time Project/ Field Based Project | 0 | 0 | 4 | 2 |
| 10 | *MC410 | Gender Sensitization Lab | 0 | 0 | 2 | 0 |
| | | **Total** | **15** | **0** | **12** | **20** |

**Note:**     **L - Theory**     **T - Tutorial**     **P - Practical**

## ELECTRONICS AND COMMUNICATION ENGINEERING

### COURSE STRUCTURE-VR24

### III B.Tech.-I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC501PC | Microcontrollers | 3 | 1 | 0 | 4 |
| 2 | EC502PC | IoT Architectures and Protocols | 3 | 0 | 0 | 3 |
| 3 | EC503PC | Control Systems | 3 | 1 | 0 | 4 |
| 4 | MS504BS | Business Economics & Financial Analysis | 3 | 0 | 0 | 3 |
| 5 | | Professional Elective – I | 3 | 0 | 0 | 3 |
| 6 | EC505PC | Microcontrollers Laboratory | 0 | 0 | 2 | 1 |
| 7 | EN506BS | Advanced English Communication Skills Laboratory | 0 | 0 | 2 | 1 |
| 8 | EC507PC | IoT Architectures and Protocols Laboratory | 0 | 0 | 2 | 1 |
| 9 | MC508BS | Intellectual Property Rights | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **2** | **6** | **20** |

### III B.Tech.-II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC601PC | Antennas and Wave Propagation | 3 | 0 | 0 | 3 |
| 2 | EC602PC | Digital Signal Processing | 3 | 0 | 0 | 3 |
| 3 | EC603PC | CMOS VLSI Design | 3 | 0 | 0 | 3 |
| 4 | | Professional Elective - II | 3 | 0 | 0 | 3 |
| 5 | | Open Elective – I | 3 | 0 | 0 | 3 |
| 6 | EC604PC | Digital Signal Processing Laboratory | 0 | 0 | 2 | 1 |
| 7 | EC605PC | CMOS VLSI Design Laboratory | 0 | 0 | 2 | 1 |
| 8 | EC606PC | Advanced Communication Laboratory | 0 | 0 | 2 | 1 |
| 9 | EC607PC | Industry Oriented Mini Project/ Internship | 0 | 0 | 4 | 2 |
| 10 | MC608BS | Environmental Science | 3 | 0 | 0 | 0 |
| | | **Total** | **18** | **0** | **10** | **20** |

**Note: L-Theory        T-Tutorial        P-Practical        C-Credits**

## ELECTRONICS AND COMMUNICATION ENGINEERING

### Professional Elective-I

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC511PE | Computer Organization & Operating Systems | 3 | 0 | 0 | 3 |
| 2 | IT512PE | Data Communications and Computer Networks | 3 | 0 | 0 | 3 |
| 3 | EC513PE | Electronic Measurements and Instrumentation | 3 | 0 | 0 | 3 |
| 4 | EC514PE | Signal Engineering & Automatic Train Protection-Kavach | 3 | 0 | 0 | 3 |

### Professional Elective-II

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC621PE | Digital Image Processing | 3 | 0 | 0 | 3 |
| 2 | EC622PE | Mobile Communications and Networks | 3 | 0 | 0 | 3 |
| 3 | EC623PE | Embedded System Design | 3 | 0 | 0 | 3 |

### Open Elective-I

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC621OE | Fundamentals of Internet of Things | 3 | 0 | 0 | 3 |
| 2 | EC622OE | Principles of Signal Processing | 3 | 0 | 0 | 3 |
| 3 | EC623OE | Digital Electronics for Engineering | 3 | 0 | 0 | 3 |

## ELECTRONICS AND COMMUNICATION ENGINEERING

## COURSE STRUCTURE-VR24

### IV B.Tech.-I Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | EC701PC | Microwave and Optical Communications | 3 | 1 | 0 | 4 |
| 2 | | Professional Elective – III | 3 | 0 | 0 | 3 |
| 3 | | Professional Elective – IV | 3 | 0 | 0 | 3 |
| 4 | | Open Elective – II | 3 | 0 | 0 | 3 |
| 5 | MS702BS | Professional Practice, Law & Ethics | 2 | 0 | 0 | 2 |
| 6 | EC703PC | Microwave and Optical Communications Laboratory | 0 | 0 | 4 | 2 |
| 7 | EC704PC | Project Stage –I | 0 | 0 | 6 | 3 |
| | | **Total** | 15 | 1 | 10 | 20 |

### IV B.Tech.-II Semester

| S.No. | Course Code | Course | L | T | P | Credits |
|---|---|---|---|---|---|---|
| 1 | | Professional Elective – V | 3 | 0 | 0 | 3 |
| 2 | | Professional Elective – VI | 3 | 0 | 0 | 3 |
| 3 | | Open Elective – III | 3 | 0 | 0 | 3 |
| 4 | EC801PC | Project Stage – II including Seminar | 0 | 0 | 22 | 11 |
| 5 | | **Total** | 9 | 0 | 22 | 20 |

**Note: L-Theory      T-Tutorial      P-Practical      C-Credits**

### Professional Elective -III

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC731PE | Radar Systems | 3 | 0 | 0 | 3 |
| 2 | EC732PE | CMOS Analog IC Design | 3 | 0 | 0 | 3 |
| 3 | EC733PE | Artificial Neural Networks | 3 | 0 | 0 | 3 |

### Professional Elective -IV

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC741PE | Network Security and Cryptography | 3 | 0 | 0 | 3 |
| 2 | EC742PE | Satellite Communications | 3 | 0 | 0 | 3 |
| 3 | EC743PE | Biomedical Instrumentation | 3 | 0 | 0 | 3 |

### Professional Elective -V

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | ML851PE | Artificial Intelligence | 3 | 0 | 0 | 3 |
| 2 | EC852PE | 5G and beyond Communications | 3 | 0 | 0 | 3 |
| 3 | ML853PE | Machine learning-ML | 3 | 0 | 0 | 3 |

### Professional Elective -VI

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | IT861PE | Multimedia Database Management Systems | 3 | 0 | 0 | 3 |
| 2 | EC862PE | System on Chip Architecture | 3 | 0 | 0 | 3 |
| 3 | EC863PE | Wireless sensor Networks | 3 | 0 | 0 | 3 |

### Open Elective-II

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC721OE | Electronic Sensors | 3 | 0 | 0 | 3 |
| 2 | EC722OE | Electronics for Health Care | 3 | 0 | 0 | 3 |
| 3 | EC723OE | Telecommunications for Society | 3 | 0 | 0 | 3 |

### Open Elective-III

| S.No. | Course Code | Course | L | T | P | Credits |
|-------|-------------|--------|---|---|---|---------|
| 1 | EC831OE | Measuring Instruments | 3 | 0 | 0 | 3 |
| 2 | EC832OE | Communication Technologies | 3 | 0 | 0 | 3 |
| 3 | CS833OE | Fundamentals of Social Networks | 3 | 0 | 0 | 3 |

**B.Tech.**                                                                                          **L   T   P   C**

**I Year - I Semester**                                                                    **3   1   0   4**

## MATRICES AND CALCULUS
(Common for CSE, CSE(AI&ML), ECE, IT, CSE(DS) )

**Course Objectives:** To learn
- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Conceptofeigenvaluesandeigenvectorsandtoreducethequadraticformtocanonicalform
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

**Course Outcomes:** After learning the contents of this paper the student must be able to
- Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Findtheextremevaluesoffunctionsoftwovariableswith/withoutconstraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

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

### UNIT-II: Eigen values and Eigen vectors
Linear Transformation and Orthogonal Transformation: Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, 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 forms by Orthogonal Transformation.

### UNIT-III: Calculus
Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta

and Gamma functions and their applications.

## UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)

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

## UNIT-V: Multivariable Calculus (Integration)

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

## Text Books:

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

## Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup>Edition, 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.

**B.Tech.**                                                                          **L   T   P   C**

**I Year - I Semester**                                                      **3   1   0   4**

# APPLIED PHYSICS
### (Common to CSE (AIML) &ECE)

**Course Objectives:** The objectives of this course for the student are to:
- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- Study the characteristics of lasers and optical fibers.

**Course Outcomes:** At the end of the course the student will be able to:
- Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
- Identify the role of semiconductor devices in science and engineering Applications.
- Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
- Appreciate the features and applications of Nanomaterials.
- Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

## UNIT - I: Quantum Physics and Solids
Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.
Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

## UNIT - II: Semiconductors and Devices
Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

## UNIT - III: Dielectric, Magnetic and Energy Materials
Dielectric Materials**:** Basic definitions- types of polarizations (qualitative)- ferroelectric, piezoelectric, and pyroelectric  materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials**:** Hysteresis - soft and hard magnetic materials - magnetostriction,

magnetoresistance - applications – bubble memory devices, magnetic field sensors and multiferroics.

Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors – materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

## UNIT - IV: Nanotechnology

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

## UNIT - V: Laser and Fiber Optics

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO2 laser, Argon ion Laser, Nd:YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture-classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

## Text Books:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

## Reference Books:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1st Edition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

**B.Tech.**                                                                                    **L   T   P   C**

**I Year - I Semester**                                                          **0   1   3   2.5**

## ENGINEERING WORKSHOP
(Common for ECE &AIML)

**Course Objectives:**
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipment's and processes those are common in the engineering field.
- To develop a |right attitude, team working, precision and safety at workplace.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have a practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

**Course Outcomes:** At the end of the course, the student will be able to:
- Study and practice on machine tools and their operations.
- Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, and foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

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

1.  Carpentry–(T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
2.  Fitting–(V-Fit, Dovetail Fit & Semi-circular fit)
3.  Tin-Smithy– (Square Tin, Rectangular Tray & Conical Funnel)
4.  Foundry–(PreparationofGreenSandMouldusingSinglePieceandSplitPattern)
5.  Welding Practice–(Arc Welding & Gas Welding)
6.  House-wiring–(Parallel & Series, Two-way Switch and Tube Light)
7.  Black Smithy–(Round to Square, Fan Hook and S-Hook)

**II. TRADES FOR DEMONSTRATION & EXPOSURE:**
Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

**Text Books:**
1.  Workshop Practice/B. L. Juneja / Cengage
2.  Workshop Manual/K. Venugopal / Anuradha.

**Reference Books:**
1.  Workshop Manual-P. Kannaiah /K.L. Narayana /Scitech
2.  Workshop Manual/ VenkatReddy /BSP

| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - I Semester** | **2** | **0** | **0** | **2** |

## ENGLISH FOR SKILL ENHANCEMENT
(Common for CSE(AIML) & ECE)

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

**Course Outcomes:** The student will learn
- Understand the importance of vocabulary and sentence structures.
- Choose appropriate vocabulary and sentence structures for their oral and  written communication.
- Demonstrate their understanding of the rules of functional grammar.
- Develop comprehension skills from the known and unknown passages.
- Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
- Acquire basic proficiency in reading and writing modules of English.

**UNIT - I**:
Chapter entitled 'Toasted English' by R.K.Narayan from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.
**Vocabulary**: The Concept of Word Formation -The Use of Prefixes and Suffixes – Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives Synonyms and Antonyms
**Gramma**r:  Identifying Common Errors in Writing with Reference to Articles and Prepositions.
**Reading**: Reading and Its Importance- Techniques for Effective Reading.
**Writing**: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing   Principles of Paragraphs in Documents.

**UNIT - II:**
Chapter entitled 'Appro JRD' by Sudha Murthy from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.
**Vocabulary**:   Words Often Misspelt - Homophones, Homonyms and Homographs
**Grammar:**     Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
**Reading**: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice
Chapter entitled 'Appro JRD' by Sudha Murthy from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.
**Vocabulary**:Words Often Misspelt - Homophones, Homonyms and Homographs
**Grammar:** Identifying Common Errors in Writing with Reference to Noun- pronoun Agreement and Subject-verb Agreement.
**Reading**:  Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

**UNIT - III**:

Chapter entitled 'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

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

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

**Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

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

**UNIT - IV**:

Chapter entitled 'Art and Literature' by Abdul Kalam from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Standard Abbreviations in English

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

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

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

**UNIT - V**:

Chapter entitled 'Go, Kiss the World' by Subroto Bagchi from "English: Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

**Vocabulary**: Technical Vocabulary and their Usage

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

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

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

**Text Books:**
1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

**Reference Books:**
1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

**B.Tech. ECE**                                                    **L   T   P   C**

**I Year - I Semester**                                            **0   0   2   1**

## ELEMENTS OF ELECTRONICS AND COMMUNICATION ENGINEERING

**Course Outcomes:** The student will learn
- Identify the different components used for electronics applications
- Measure different parameters using various measuring instruments
- Distinguish various signal used for analog and digital communications

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

**B.Tech.**                                                                                    **L   T   P   C**

**I Year - I Semester**                                                                **0   0   3   1.5**

# APPLIED PHYSICS LABORATORY
## (Common to CSE(AIML),ECE)

**Course Objectives:** The objectives of this course for the student to
- Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
- Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
- Able to measure the characteristics of dielectric constant of a given material.
- Study the behavior of B-H curve of ferromagnetic materials.
- Understanding the method of least squares fitting

**Course Outcomes:** The students will be able to:
- Know the determination of the Planck's constant using Photo electric effect and identify the  material whether it is n-type or p-type by Hall experiment.
- Appreciate quantum physics in semiconductor devices and optoelectronics.
- Gain the knowledge of applications of dielectric constant.
- Understand the variation of magnetic field and behavior of hysteresis curve.
- Carried out data analysis.

**List Of Experiments:**
1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b)  V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a)Determination of the beam divergence of the given LASER beam
    b)Determination of Acceptance Angle and Numerical Apertureof an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

**Reference Book:**
1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"-
   S Chand Publishers, 2017.

| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - I Semester** | **0** | **0** | **2** | **1** |

## ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY
(Common for CSE(AIML) & ECE)

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

**Course Outcomes:** The student will learn
- Understand the nuances of English language through audio- visual experience and group activities.
- Neutralize their accent for intelligibility.
- Speak with clarity and confidence which in turn enhances their employability skills

**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

**Exercise – I**
**CALL Lab:**
*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.
*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*
**ICS Lab:**
*Understand:* Spoken vs. Written language- Formal and Informal English.
*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise- II**

**CALL Lab:**

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

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

**ICS Lab:**

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

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

**Exercise - III**

**CALL Lab:**

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

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

**ICS Lab:**

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

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

**Exercise – IV**

**CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests - Testing Exercises

**ICS Lab:**

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

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

**Exercise – V**

**CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests -Testing Exercises

**ICS Lab:**

*Understand:* Group Discussion

*Practice:* Group Discussion

**Computer Assisted Language Learning (CALL) Lab:**

1. 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:

   Computers with Suitable Configuration

   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.

**Source of Material (Master Copy):**

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

**Note:** Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

**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).
- Digital All
- Orell Digital Language Lab (Licensed Version)

**Reference Books:**

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford University Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press.

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

| B Tech | L | T | P | C |
|--------|---|---|---|---|
| I Year – I Semester | 3 | 0 | 0 | 0 |

## ENVIRONMENTAL SCIENCE
### (Common for ECE & AIML)

**Course Objectives**:
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations.

**Course Outcomes:**
- Based on this course, the Engineering graduate will understand /evaluate develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

**UNIT-I**

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

**UNIT-II**

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

**UNIT-III**

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

**UNIT-IV**

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Waste water Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation.

**Global Environmental Issues 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. NAPCC-GoI Initiatives.

**UNIT-V**

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, 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 life style.

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

**Reference Books:**
1. Environmental Science: towards as ustainable future by RichardT.Wright.2008PHL 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 Danie lB.Botkin&Ed ward A.Keller,Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4thEdition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

**B.Tech.**                                                                                    **L   T   P   C**

**I Year - II Semester**                                                              **3   1   0   4**

### ORDINARYDIFFERENTIALEQUATIONSANDVECTORCALCULUS
(Common for CSE, CSE(AI&ML), ECE, IT, CSE(DS))

**Course Objectives:** To learn
- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms.
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course outcomes:** After learning the contents of this paper the student must be able to
- Identify whether the given differential equation of first order is exact or not.
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another.

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

### UNIT-II: Ordinary Differential Equations of Higher Order
Second 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, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation. Applications: Electric Circuits.

### UNIT-III: Laplace transforms
Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied 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
Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

### UNIT-V: Vector Integration
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, 36$^{th}$Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,
   5$^{th}$ Edition, 2016.

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

| B Tech | L | T | P | C |
|---|---|---|---|---|
| I Year - II Semester | 3 | 1 | 0 | 4 |

## ENGINEERINGCHEMISTRY
### (Common to CSE(AIML) & ECE)

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

**Course Outcomes**:
- Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
- The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
- They can learn the fundamentals and general properties of polymers and other engineering materials.
- They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

### UNIT - I: Water and its treatment:
Introduction to hardness of water – Estimation of hardness of water by complex metric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation - Determination of F- ion by ion- selective electrode method.
**Boiler troubles**: Sludges, Scales 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 water – Reverse osmosis

### UNIT – II Battery Chemistry & Corrosion
**Introduction** - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.
**Corrosion**: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods-Cathodic protection – Sacrificial anode and impressed current methods.

### UNIT - III: Polymeric materials:
**Definition** – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene Plastics: Definition and characteristics- thermoplastic and thermosetting

plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP). Rubbers: Natural rubber and its vulcanization.

**Elastomers**: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

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

**Biodegradable polymers**: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

## UNIT - IV: Energy Sources:

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

## UNIT - V: Engineering Materials:

**Cement:** Portland cement, its composition, setting and hardening. Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermo response materials- Polyacryl amides, Poly vinyl amides

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

## Text Books:

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

## Reference Books:

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

| B.Tech. | L | T | P | C |
|---|---|---|---|---|
| I Year - II Semester | 1 | 0 | 4 | 3 |

## COMPUTER AIDED ENGINEERING GRAPHICS
### (Common for CSE(AIML) & ECE)

**Course Objectives:**
- To develop the ability of visualization of different objects through technical drawings.
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products.

**Course Outcomes:** At the end of the course, the student will be able to:
- Apply computer aided drafting tools to create 2D and 3D objects.
- Sketch conics and different types of solids .
- Appreciate the need of Sectional views of solids and Development of surfaces of solids.
- Read and interpret engineering drawings .
- Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting.

**UNIT-I**: **Introduction to Engineering Graphics:**
Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics.


**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.

**UNIT–III Projections of Regular Solids**:
Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views.

**UNIT-IV**: **Development of Surfaces of Right Regular Solids:**
Prism, Cylinder, Pyramid and Cone, Development of surfaces 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 –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

**Text Books:**
1. Engineering Drawing N.D. Bhatt / Charotar Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

**Reference Books:**
1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

**B.Tech.** **L T P C**
**I Year - II Semester** **2 0 0 2**

## BASIC ELECTRICAL ENGINEERING
(Common for CSE(AIML) & ECE)

**Course Objectives:**
- To understand DC and Single & Three phase AC circuits.
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, powerfactor and its improvement.

**Course Outcomes:** After learning the contents of this paper the student must be able to
- Understand and analyze basic Electrical circuits.
- Study the working principles of Electrical Machines and Transformers.
- Introduce components of Low Voltage Electrical Installations.

**UNIT-I:**
**D.C. Circuits:** Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

**UNIT-II:**
**A.C. Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT-III:**
**Transformers:** Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT-IV:**
**Electrical Machines:** Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

**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.

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

**B.Tech.**                                                                                  **L  T  P  C**

**I Year - II Semester**                                                                     **2  0  0  2**

### ELECTRONIC DEVICES AND CIRCUITS
(Common for CSE, CSE(AI&ML), CSE(DS), IT & ECE)

**Course Objectives:**
- To introduce components such as diodes, BJTs and FETs.
- To know the applications of devices.
- To know the switching characteristics of devices

**Course Outcomes:** The student will learn
- Acquire the knowledge of various electronic devices and their use on real life.
- Know the applications of various devices.
- Acquire the knowledge about the role of special purpose devices and their applications.

**UNIT - I**: **Diodes**

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

**UNIT - II: Diode Applications:**

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

**UNIT - III**: **Bipolar Junction Transistor (BJT):**

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times.

**UNIT - IV**: **Junction Field Effect Transistor (FET):**

Construction, Principle of Operation, Pinch-Off Voltage, Volt- Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

**UNIT - V**: **Special Purpose Devices:**

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

**Text Books:**
1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

**Reference Books:**
1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5[th]Edition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles   and Applications, Cambridge, 2018.

**B.Tech. ECE**                                                    **L   T   P   C**

**I Year - II Semester**                                          **0   0   2   1**

### ELECTRONIC DEVICES AND CIRCUITS LABORATORY

**Course Outcomes:** The student will learn
- Acquire the knowledge of various semiconductor devices and their use in real life.
- Analyze the applications of diode.
- Design aspects of biasing and keep them in active region of the device for functional circuits
- Ability to design and analyze simple BJT and MOSFET circuits.
- Acquire the knowledge about the role of special purpose devices and their applications

### LIST OF EXPERIMENTS:

1. PN Junction diode characteristics   A) Forward bias B) Reverse bias.
2. Full Wave Rectifier with & without filters
3. Types of Clippers at different reference voltages
4. Types of Clampers at different reference voltages
5. The steady state output waveform of clampers for a square wave input
6. Input and output characteristics of BJT in CB Configuration
7. Input and output characteristics of BJT in CE Configuration
8. Input and output characteristics of BJT in CC Configuration
9. Input and output characteristics of MOS FET in CS Configuration
10. Input and output characteristics of MOS FET in CD Configuration
11. Switching characteristics of a transistor
12. Zener diode characteristics and Zener as voltage Regulator
13. SCR Characteristics.
14. UJT Characteristics and identify negative region
15. Photo diode characteristics
16. Solar cell characteristics
17. LED Characteristics
    *Design a circuit to switch on and off LED using diode/BJT/FET as a switch.

### Major Equipment required for Laboratories:

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

**B Tech**                                                                                    **L   T   P   C**

**I Year - II Semester**                                                          **0   0   2   1**

### ENGINEERING CHEMISTRY LABORATORY
(Common for **CSE(AIML) & ECE** )

**Course Objectives:** The course consists of experiments related to the principles of Chemistry required for engineering student. The student will learn:
- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry,
- Potentiometry and pH metry methods.  Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

**Course Outcomes**: The experiments will make the student gain skills on:
- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

**List of Experiments:**
1. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
2. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
3. **Potentiometry:** Estimation of the amount of $Fe^{+2}$ by Potentiomentry.
4. **PH Metry:** Determination of an acid concentration using pH meter.
5. **Preparations:**
   a. Preparation of Bakelite.
   b. Preparation of Nylon–6.
6. **Lubricants:**
   a. Estimation of acid value of given lubricant oil.
   b. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
7. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.
8. **Virtual lab experiments**
   a. Construction of Fuel cell and it's working.
   b. Smart materials for Biomedical applications
   c. Batteries for electrical vehicles.
   d. 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 5$^{th}$Edition
3. Inorganic Quantitative analysis by A. I. Vogel, ELBS Publications.
4. College Practical Chemistry byV. K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

| **B.Tech** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - II Semester** | **0** | **0** | **2** | **1** |

### BASIC ELECTRICAL ENGINEERING LABORATORY
(Common for CSE(AIML) & ECE)

**Course Objectives:**
- To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

**Course Outcomes:** After learning the contents of this paper, the student must be able to
- Verify the basic Electrical circuits through different experiments.
- Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
- Analyze the transient responses of R, L and C circuits for different input conditions.

**List of experiments/demonstrations:**
   **PART- A (compulsory)**
   1. Verification of KVL and KCL
   2. Verification of Thevenin's and Norton's theorem
   3. Transient Response of Series RL and RC circuits for DC excitation
   4. Resonance in series RLC circuit
   5. Calculations and Verification of Impedance and Current of RL, RC and RLC Series circuits
   6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
   7. Performance Characteristics of a DC Shunt Motor
   8. Torque-Speed Characteristics of a Three-phase Induction Motor.
   **PART-B (any two experiments from the given list)**
   1. Verification of Superposition theorem.
   2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
   3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
   4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
   5. No-Load Characteristics of a Three-phase Alternator

**Text Books:**
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4$^{th}$ Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2$^{nd}$ Edition, 2008.

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

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

| **B.Tech.** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **I Year - II Semester** | **0** | **1** | **2** | **2** |

## Applied Python Programming Laboratory
### (ECE)

**Course Objectives:**

- To install and run the Python interpreter.
- To learn control structures.
- To Understand Lists, Dictionaries in Python
- To analyse the hardware boards through Python

**Course Outcomes:** Upon completing this course, the students will be able to

- Build basic programs using fundamental programming constructs.
- Write and execute python codes for different applications.
- Capable to implement on hardware boards.

Note: The lab experiments will be like the following experiment examples.

**Cycle - 1**

1. Downloading and Installing Python and Modules

   a) Python 3 on Linux

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

   b) Python 3 on Windows

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

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

   c) pip3 on Windows and Linux

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

   d) Installing numpy and scipy

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

   e) Installing jupyterlab

   Install from pip using the command pip install jupyterlab

2. Introduction to Python3
   a) Printing your biodata on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a perfect number, i.e.,

the sum of all its factors (excluding the number itself) is equal to the number itself

3. Defining and Using Functions

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

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

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

    d) Write a function $N(m, s) = \exp(-(x-m)^2 /(2s^2 ))/\sqrt{2\pi}s$ that computes the Normal

4. The package numpy

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

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

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

5. The package scipy and pyplot

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

    b) Plotting data read from a file

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

    d) Plotting a histogram of a given data set

6. The strings package

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

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

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

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

**Cycle -2**

7.Installing OS on Raspberry Pi

    a) Installation using PiImager

    b) Installation using image file

      Downloading an Image

      Writing the image to an SD card

      Using Linux

      Using Windows

      Booting up

      Follow the instructions given in the URL

https://www.raspberrypi.com/documentation/computers/getting-started.html

8. Accessing GPIO pins using Python

    a) Installing GPIO Zero library. First, update your repositories list: sudo apt update

    Then install the package for Python 3: sudo apt install python3-gpiozero

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

c) Adjusting the brightness of an LED

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

9. Collecting Sensor Data

a) DHT Sensor interface

Connect the terminals of DHT GPIO pins of Raspberry Pi.

Import the DHT library using import Adafruit_DHT

Read sensor data and display it on screen

**TEXT BOOKS:**

**1. Supercharged Python:** Take your code to the next level, Overland

**2. Learning Python, Mark Lutz, O'reilly**

**REFERENCE BOOKS:**

1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.

2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

3. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson

4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition

5. Think Python, Allen Downey, Green Tea Press

6. Core Python Programming, W. Chun, Pearson

7. Introduction to Python, Kenneth A. Lambert, Cengage

| **B.Tech (ECE)** | | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **II Year - I Semester** | | **3** | **1** | **0** | **4** |

## NUMERICAL METHODS AND COMPLEX VARIABLES

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

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

**Course outcomes:** After learning the contents of this paper the student must be able to
- Express any periodic function in terms of sine and cosine
- Find the root of a given polynomial and transcendental equations.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given first order ODE's
- Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
- Taylor's and Laurent's series expansions in complex function

**UNIT-I: Fourier Series & Fourier Transforms:**
Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosine transforms - Inverse Fourier transforms**.**

**UNIT-II: Numerical Methods-I**
**Solution of polynomial and transcendental equations:** Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.
**Finite differences:** forward differences, backward differences, central differences, symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae.
**Central difference interpolation:** Gauss's forward and backward formulae, Lagrange's method of interpolation**.**

**UNIT-III: Numerical Methods-II**
**Numerical integration:** Trapezoidal rule and Simpson's 1/3rd and 3/8th rules.
**Ordinary differential equations:** Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order for first order ODE.

**UNIT-IV: Complex Differentiation**
Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations

(without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties. (All theorems without Proofs), Conformal mappings, Mobius transformations**.**

**UNIT-V: Complex Integration:**
Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem and their properties. (All theorems without Proofs)

**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. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.

2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

**B.Tech. ECE**                                                                          **L    T    P        C**

**II Year – I Semester**                                                        **3    1    0        4**

## ANALOG CIRCUITS

**Course Objectives:**
- Learn the concepts of, load line analysis and biasing techniques
- Learn the concepts of high frequency analysis of transistors.
- To give understanding of various types of amplifier circuits
- Learn the concepts of small signal analysis of BJT and FET
- To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.

**Course Outcomes: Upon completing this course, the students will be able to**
- Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
- Develop the Ability to understand the design and working of BJT / FET amplifiers.
- Design amplifier circuits using BJT s And FET's. and observe the amplitude and frequency responses of common amplifier circuits
- Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
- Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.

**UNIT - I**: **BJT Biasing**
Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing -Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diode
**Analysis and Design of Small Signal Low Frequency BJT Amplifiers:** Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h-parameters in CE,CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

**UNIT - II: FET- Biasing Techniques**
**FET Amplifiers:** Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOSFET Amplifiers, MOS Small signal model, Common source amplifier with resistive, Diode connected and Current source loads, Source follower, Common Gate Stage, Cascode and Folded Cascode Amplifier – frequency response.

**UNIT - III**: **Multistage Amplifiers:**
Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade RC Coupled amplifiers, Cascode amplifier, Darlington pair.
**Transistor at High Frequency:** Hybrid - model of Common Emitter transistor model, $f\alpha$, $f\beta$ and unity gain bandwidth, Gain-bandwidth product.

**UNIT - IV: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.transition count testing, signature analysis and test bridging faults.

**UNIT - VOscillators:**

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.

**Text Books:**

1. Jacob Millman, Christos C Halkias -Integrated Electronics, McGraw Hill Education.
2. Robert L. Boylestead, Louis Nashelsky -Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson.

**Reference Books:**

1. David A. Bell – Electronic Devices and Circuits, 5th Edition, Oxford.
2. Adel S. Sedra, Kenneth C. Smith- Microelectronic Circuits- Theory and Applications, Oxford.
3. Chinmoy Saha, Arindam Halder, Debaati Ganguly -Basic Electronics-Principles and Applications, 2018, Cambridge.

**B.Tech. ECE**                                                      **L   T   P      C**

**II Year – I Semester**                                            **3   1   0      3**

# NETWORK ANALYSIS AND SYNTHESIS

**Course Objectives:**
1. To understand the basic concepts on RLC circuits.
2. To know the behaviour of the steady state and transient states in RLC circuits.
3. To understand the two port network parameters.
4. Learn the design concepts of various filters and attenuators

**Course Outcomes:** Upon successful completion of the course, students will be able to:
1. Gain the knowledge on basic RLC circuit's behaviour.
2. Analyze the Steady state and transient analysis of RLC Circuits.
3. Know the characteristics of two port network parameters.
4. Analyse the Design aspect of various filters and attenuators
5. Synthesize LC, RC and RL Functions by foster and causer methods

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

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

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

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

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

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

**Reference Books:**
1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education, 1999.
2. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw- Hill

Publications

3. William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., William Hayt and Jack E. Kimmerley, McGraw Hill Company.

**B.Tech. ECE**                                                                    **L   T   P   C**

**II Year – I Semester**                                                      **3   0   0   3**

# DIGITAL LOGIC DESIGN

**Course Objectives:**
1. To understand common forms of number representation in logic circuits.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3. To understand the concepts of combinational logic circuits and sequential circuits.
4. To understand the Realization of Logic Gates Using Diodes & Transistors.

**Course Outcomes:** Upon completing this course, the students will be able to
1. Understand the numerical information in different forms and Boolean Algebra theorems
2. Postulates of Boolean algebra and to minimize combinational functions
3. Design and analyze combinational circuits
4. Design and analyze registers and counters
5. Known about the finite state machines and its applications

## UNIT - I: Number Systems:
Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.
**Boolean algebra:** Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

## UNIT - II: Minimization of Boolean functions:
Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method
**Realization of Logic Gates Using Diodes & Transistors:** AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate-Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, IC interfacing- TTL driving CMOS & CMOS driving TTL.

## UNIT - III: Combinational Logic Circuits:
Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.
**Sequential Circuits Fundamentals:** Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

## UNIT - IV: Registers and Counters:
Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.
**Sequential Machines:** Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N Counters.

**UNIT – V: Finite state machine:**

Capabilities and limitations, Mealy and Moore models, State equivalence and machine minimization, simplification of incompletely specified machines, Merger graphs. Asynchronous design-modes of operation, Hazards, synthesis of SIC fundamental mode circuits, synthesis of burst mode circuits. Introduction to ASM Charts

**Text Books:**

1. Zvi Kohavi &Niraj K. Jha, - Switching and Finite Automata Theory, 3rd Ed., Cambridge, 2010.
2. R. P. Jain - Modern Digital Electronics, 3rd Edition, 2007- Tata McGraw-Hill

**Reference Books:**

1. Morris Mano, Fredriac J. Hill, Gerald R. Peterson - Introduction to Switching Theory and Logic Design –3rd Ed., John Wiley & Sons Inc.
2. Charles H. Roth - Fundamentals of Logic Design, 5th ED., Cengage Learning, 2004

**B.Tech. ECE**                                                                          **L    T    P    C**

**II Year – I Semester**                                                          **3    1    0    4**

## SIGNALS AND SYSTEMS

**Course Objectives:The objectives of this subject are to**
1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
3. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4. Identify the need for sampling of CT signals, types and merits and demerits of each type.

**Course Outcomes: Upon completing this course the students able to:**
- Characterize various signals, systems and their time and frequency domain analysis, using transform techniques.
- Identify the conditions for transmission of signals through systems and conditions for
- Physical realization of systems.
- Use sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles.
- Apply the correlation and PSD functions for various applications.

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

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

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

**UNIT - IV: Laplace Transforms:**
Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N Counters
**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.

**UNIT – V: Sampling theorem**:

Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

**Correlation:** Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Energy Density Spectrum, Parsevals Theorem, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Relation between Convolution and Correlation, Detection of Periodic Signals in the presence of Noise by Correlation, Extraction of Signal from Noise by Filtering.

**Text Books:**
1. B.P. Lathi -Signals, Systems & Communications, BSP, 2013.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawabi -Signals and Systems, 2nd Ed., Prentice Hall

**Reference Books:**
1. Simon Haykin and Van Veen, A. Rama Krishna Rao, -Signals and Systems, TMH, 2008.
2. Michel J. Robert - Fundamentals of Signals and Systems, MGH International Edition, 2008.
3. C. L. Philips, J. M. Parr and Eve A. Riskin -Signals, Systems and Transforms, 3rd Ed., PE, 2004.

**B.Tech. ECE**         **L   T   P    C**

**II Year – I Semester**         **0   0   2    1**

## ANALOG CIRCUITS LABORATORY

**Course Outcomes:** To learn Upon completing this course the students will be able to
- Study different meters and instruments for measurement of electronic quantities
- Study the characteristics of different semiconductor devices like diode, BJT, FET, UJT etc experimentally
- Design and experiment with various application circuits using diodes
- Design and experiment with various signal and power amplifier circuits using BJTs and FETs
- Design and experiment with various voltage regulation circuits

**List of Experiments (Twelve experiments to be done):**
Verify any twelve experiments in H/W Laboratory
1. Perform an experiment to choose Q-point for a Transistor that operate in active region and observe the effect of external Load resistance on Q-point.
2. Design a Self bias Circuit and determine the Q-point of the Transistor and its Stability factor b  both simulation and realization with hardware components.
3. Obtain the I/O Characteristics of CE, CB, CC amplifiers. Calculate h-parameters from the Characteristics.
4. Design and Simulate a Common Drain Amplifier with voltage divider bias and determine the Stability factor.
5. Obtain the Drain and Transfer characteristics of CD, CS amplifiers of JFET. Calculate gm, rd from the Characteristics.
6. By experiment prove that the voltage gain of Emitter Follower Circuit is one.
7. Design a Common Emitter Amplifier with a gain of 30db and Bandwidth of 10KHZ and plot the frequency response practically.
8. Design a two stage RC Coupled amplifier and prove that gain is increased and analyze the effects of coupling capacitance.
9. Practically prove that the Darlington pair has high input impedance.
10. Draw the high frequency response of common emitter transistor amplifier and calculate fα, fβ and gain bandwidth product.
11. Design a cascode amplifier for a given specifications
12. Design four topologies of feedback amplifiers and draw the frequency response of them with and without feedback.
13. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
14. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.

**Major Equipment required for Laboratories:**
1. Regulated Power Suppliers, 0-30V
2. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
3. Functions Generators-Sine and Square wave signals

4. Multimeters
5. Electronic devices

**B.Tech. ECE**                                                                     **L   T   P      C**

**II Year – I Semester**                                                         **0   0   2      1**

# DIGITAL LOGIC DESIGN LABORATORY

**Course Outcomes:** Upon completing this course, the students will be able to
- Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
- Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
- Design and analyze sequential circuits for various cyclic functions.
- Characterize logic families and analyze them for the purpose of AC and DC parameters

**List of Experiments (Twelve experiments to be done):**

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

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

**B.Tech. ECE**                                                    **L**   **T**   **P**   **C**

**II Year – I Semester**                                           **0**   **0**   **2**   **1**

## BASIC SIMULATION LABORATORY

**Course Outcomes:** Upon completing this course, the students will be able to
- Generate, analyze and perform various operations on Signals/Sequences both in time and Frequency domain
- Analyze and Characterize Continuous and Discrete Time Systems both in Time and
- Frequency domain along with the concept of Sampling
- Generate different Random Signals and capable to analyze their Characteristics
- Apply the Concepts of Deterministic and Random Signals for Noise removal Applications and on other Real Time Signals

**Note:**
1. All the experiments are to be simulated using MATLAB or equivalent software
2. Minimum of 15 experiment are to be completed

**List of Experiments:**
 1. Basic Operations on Matrices.
 2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
 3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
 4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
 5. Convolution for Signals and sequences.
 6. Auto Correlation and Cross Correlation for Signals and Sequences.
 7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
 8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
 9. Gibbs Phenomenon Simulation.
 10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
 11. Waveform Synthesis using Laplace Transform.
 12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
 13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
 14. Verification of Sampling Theorem.
 15. Removal of noise by Autocorrelation / Cross correlation.
 16. Extraction of Periodic Signal masked by noise using Correlation.
 17. Verification of Weiner-Khinchine Relations.
 18. Checking a Random Process for Stationarity in Wide sense..

**Major Equipment required for Laboratories:**
1. Computer System with latest specifications connected
2. Window Xp or equivalent

3. Simulation software-MAT Lab or any equivalent simulation software

**B.Tech (ECE)**                                      **L   T   P   C**
**II Year - I Semester**                               **3   0   0   0**

## Constitution of India

**Course Objectives:**
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** The student will learn
- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- To prepare, analyze, and interpret financial statements.
- Discuss the passage of the Hindu Code Bill of 1956.

**UNIT-I:**
History of Making of the Indian Constitution- History of Drafting Committee.

**UNIT-II:**
Philosophy of the Indian Constitution- Preamble Salient Features

**UNIT-III:**
Contours of Constitutional Rights & Duties - Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Right
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

**UNIT-IV:**
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

**UNIT-V:**
Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

**UNIT-VI:**

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

**Suggested Reading:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

**B.Tech. ECE**                                                    **L   T   P   C**

**II Year – II Semester**                                          **3   0   0   3**

## PROBABILITY THEORY AND STOCHASTIC PROCESSES

**Course Objectives:**
- This gives basic understanding of random variables and operations that can be performed on them.
- To known the Spectral and temporal characteristics of Random Process.
- To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

**Course Outcomes:** Upon completing this course, the students will be able to
- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.
- Determine the temporal characteristics of Random Signals.
- Determine the Spectral characteristics of Random Signals.
- Understand the concepts of Noise in Communication systems.

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

### UNIT - II: Operations on Single & Multiple Random Variables – Expectations:
Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence. Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

### UNIT - III: Random Processes – Temporal Characteristics:

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

## UNIT - IV: Random Processes – Spectral Characteristics:

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

## UNIT - V: Noise Sources & Information Theory:

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties. Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

**Text Books:**
1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4th Ed, TMH, 2001.
2. Taub and Schilling - Principles of Communication systems, TMH, 2008

**Reference Books:**
1. Bruce Hajck - Random Processes for Engineers, Cambridge unipress, 2015
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic Processes, 4th Ed., PHI, 2002.
3. B.P. Lathi - Signals, Systems & Communications, B.S. Publications, 2003.
4. S.P Eugene Xavier -Statistical Theory of Communication, New Age Publications, 2003

**B.Tech. ECE**                                                    **L   T   P     C**

**II Year – II Semester**                                    **3   0   0     3**

## ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

**Course Objectives:**
- To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields.
- Magneto static Fields, and apply them to solve physics and engineering problems.
- To distinguish between static and time-varying fields, and understand the significance
- To utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
- To study the propagation, reflection and transmission of planewaves inbounded and unbounded media.

**Course Outcomes:** Upon completing this course, the student able to
- Get the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields.
- Get the knowledge of Basic Laws, Concepts and proofs related to Magnetostatic Fields.
- Characterize the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions
- Analyze the Wave Equations and classify conductors, dielectrics and evaluate the UPW Characteristics for several practical media of interes
- Analyze the Design aspect of transmission line parameters and configurations

### UNIT - I: 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, 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: Magnetostatics:

Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

### UNIT - III: Maxwell's Equations (Time Varying Fields):

Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Two Equations for Magnetostatic Fields, Maxwell's Two Equations for Electrostatic Fields Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric-Dielectric and Dielectric-Conductor Interfaces.

**UNIT - IV: 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 - V**: **Transmission Lines:**

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, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.SC and OC Lines, $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines, Reflection Coefficient, VSWR Smith Chart – Configuration and Applications, Single Stub Matching.

**Text Books:**
1. William H. Hayt Jr. and John A. Buck- Engineering Electromagnetics, 8th Ed., McGraw Hill, 2014
2. Matthew N.O. sadiku and S.V. Kulkarni - Principles of Electromagnetics, 6th Ed., Oxford University Press, Aisan Edition, 2015.

**Reference Books:**
1. JD. Kraus -Electromagnetics with Applications ,5th Ed., TMH
2. Umesh Sinha, Satya Prakashan -Transmission Lines and Networks, (Tech. India Publications), New Delhi, 2001.
3. JD Ryder -Networks, Lines and Fields, 2nd Ed., PHI, 1999

| | | | |
|---|---|---|---|
| **B.Tech. ECE** | **L** | **T** | **P** | **C** |
| **II Year – II Semester** | **3** | **0** | **0** | **3** |

# ANALOG AND DIGITAL COMMUNICATIONS

**Course Objectives:**
- To develop ability to analyze system requirements of Analog and digital communication systems.
- To understand the generation, detection of various Analog and digital modulation techniques.
- To acquire the vortical knowledge of each block in AM, FM transmitters and receivers.
- To understand the concepts of baseband transmissions.
- To understand the effect of noise on the performance of AM and FM receivers and the principles of PAM, PWM, and PPM, TDM, and FDM techniques.

**Course Outcomes:** Upon completing this course, the student able to
- Analyze and design of various continuous wave and amplitude modulation and demodulation technique.
- Understand the effect of noise present in continuous wave and angle modulation techniques.
- Attain the knowledge about AM , FM Transmitters and Receivers
- Analyze and design the various Pulse Modulation Techniques
- Understand the concepts of Digital Modulation Techniques and Baseband transmission

## UNIT - I: 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: 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: Transmitters:
Classification of Transmitters AM Transmitters, FM Transmitters.
**Receivers:** Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking,

Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

**UNIT - IV: Pulse Modulation:**

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

**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**: **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.

**Baseband Transmission and Optimal Reception of Digital Signal:** A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

**Text Books:**
1. Simon Haykin -Analog and Digital Communications, John Wiley, 2005.
2. Wayne Tomasi - Electronics Communication Systems-Fundamentals through Advanced, 5th Ed., PHI, 2009.

**Reference Books:**
1. Herbert Taub, Donald L Schilling, Goutam Saha, -Principles of Communication Systems, 3rd Ed., McGraw-Hill, 2008.
2. Dennis Roddy and John Coolean - Electronic Communications, 4th Ed., PEA, 2004
3. George Kennedy and Bernard Davis - Electronics & Communication System, TMH, 2004
4. K. Sam Shanmugam - Analog and Digital Communication, Willey, 2005

**B.Tech. ECE**           **L T P C**

**II Year – II Semester**           **3 0 0 3**

## LINEAR AND DIGITAL IC APPLICATIONS

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

- To introduce the basic building blocks of linear integrated circuits.
- To introduce the theory and applications of Analog multipliers and PLL.
- To introduce the concept sine waveform generation and introduce some special function ICs.
- To understand and implement the working of basic digital circuits.
- To study and design various linear and nonlinear applications of Op-Amps.

**Course Outcomes:** Upon completing this course, the students will be able to

- Understand and analyze the IC 741 operational amplifier and its characteristics.
- Attain the knowledge of functional diagrams and applications of IC 555 and IC 565
- Acquire the knowledge about the Data converters
- Acquire the knowledge and design the Combinational circuit using suitable digital ICs
- Acquire the knowledge and design the Sequential circuit using suitable digital ICs

**UNIT - I**: **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: Op-Amp, IC-555 & IC565 Applications:**
Introduction to Active Filters, Characteristics of Bandpass, Bandreject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer-Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL-Block Schematic, principle and Applications.

**UNIT - III**: **Data Converters:**
Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs – Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

**UNIT - IV: Combinational Logic ICs:**

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

**UNIT - V: Sequential Logic IC's and Memories:**

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

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

**Text Books:**
1. Ramakanth A. Gayakwad - Op-Amps & Linear ICs, PHI, 2003.
2. Floydand Jain- Digital Fundamentals, 8th Ed., Pearson Education, 2005.

**Reference Books:**
1. D. 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., Pearson Education India, 2009.

**B.Tech. ECE**           **L   T   P    C**

**II Year – II Semester**           **3   0   0    3**

# ELECTRONIC CIRCUIT ANALYSIS

**Course Objectives:** Upon completing this course, the student twill be able to

- Learn the concepts of Power Amplifiers.

- To give understanding of tuned amplifier circuits

- Understand various multivibrators using transistors and sweep circuits.

**Course Outcomes:** Upon completing this course, the students will be able to
- Design and analysis of the DC bias circuitry of BJT
- Design and analysis of the DC bias circuitry of FET
- Analyze the different types of the amplifiers, operation and its characteristics
- Design circuit like amplifiers
- Design circuit like oscillators using the transistors, diodes

### UNIT - I: **Large Signal Amplifiers**
Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class –C and D Amplifiers.

### UNIT - II: Tuned Amplifiers:
Introduction, single Tuned Amplifiers – Q-factor, frequency response, Double Tuned Amplifiers – Q-factor, frequency response, Concept of stagger tuning and synchronous tuning

### UNIT - III: **Multivibrators**
Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

### UNIT - IV: Time Base Generators
General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

### UNIT - V:

### Synchronization and Frequency Division:
Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuits, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

### Sampling Gates:
Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits.

**Text Books:**
1. Jacob Millman, Christos C Halkias - Integrated Electronics, , McGraw Hill Education.
2. J. Millman, H. Taub and Mothiki S. PrakashRao - Pulse, Digital and Switching Waveforms –2nd Ed., TMH, 2008,

**Reference Books:**
1. David A. Bell - Electronic Devices and Circuits, 5th Ed., Oxford.
2. Robert L. Boylestead, Louis Nashelsky - Electronic Devices and Circuits theory, 11th Ed., Pearson, 2009
3. Ronald J. Tocci - Fundamentals of Pulse and Digital Circuits, 3rd Ed., 2008.
4. David A. Bell - Pulse, Switching and Digital Circuits, 5th Ed., Oxford, 2015.

**B.Tech. ECE**                                                                           **L   T   P      C**

**II Year – II Semester**                                                         **0   0   2      1**

### ANALOG AND DIGITAL COMMUNICATIONS LABARATORY

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

**Course Outcomes:** Upon completing this course, the student able to
- Demonstrate generation and detection of analog and digital modulation techniques.
- Explain sampling, PCM, delta modulation, adaptive delta modulation and super heterodyne receiver.
- Compare the different analog and digital modulation techniques.
- Distinguish various line coding schemes used for digital data transmission.
- Apply time division multiplexing concepts in different pulse modulation techniques.

**List of Experiments (Twelve experiments to be done):**
1. (i) Amplitude modulation and demodulation (ii) Spectrum analysis of AM
2. (i) Frequency modulation and demodulation (ii) Spectrum analysis of FM
3. DSB-SC Modulator & Detector
4. SSB-SC Modulator & Detector (Phase Shift Method)
5. Frequency Division Multiplexing & De multiplexing
6. Pulse Amplitude Modulation & Demodulation
7. Pulse Width Modulation & Demodulation
8. Pulse Position Modulation & Demodulation
9. PCM Generation and Detection
10. Delta Modulation
11. DPCM Generation and Detection
12. Frequency Shift Keying: Generation and Detection
13. Binary Phase Shift Keying: Generation and Detection
14. Generation and Detection (i) DPSK (ii) QPSK
15. Generate FSK modulated signal using PLL
   *Prove practically the Figure of Merit of DSB-SC is unity for single tone modulation

**Major Equipment required for Laboratories:**
1. CROs: 20MHz
2. Function Generators: 2MHz
3. Spectrum Analyzer
4. Regulated Power Supplies: 0-30V
5. MAT Lab/Equivalent Simulation Package with Communication tool box

**B.Tech. ECE**                                                                                              **L   T   P   C**

**II Year – II Semester**                                                                             **0   0   2   1**

## LINEAR AND DIGITAL IC APPLICATIONS LABORATORY

**Course Outcomes:** Upon completing this course, the student able to
- Understand the basics of Op-Amp and implement the linear applications of 741 IC
- Design the first order filters and generate different types of input signals using 741 IC
- Design the multivibrator circuits using IC555 and determine the frequency of oscillation
- Determine the Hysteresis voltage of Schmitt trigger using 741 Op-Amp
- Construct and analyze voltage regulator circuits

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

**List of Experiments (Twelve experiments to be done):**

**Design and Implementation of:**
1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of 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 frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stableMultivibratorusingIC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
11. Design VoltageRegulatorusingIC723, IC 7805/7809/7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
14. Design a Gray code converter and verify its truth table.
15. Design an even priority encoder using IC 74xx and verify its truth table.
16. Design a 8x1 multiplexer 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/down counter usingIC74163 and draw read/write waveforms.
20. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read/write operation.
22. Design a 8x3 encoder/3x8 decoder and verify its truth table.

**Major Equipment required for Laboratories:**
1. 5 V Fixed Regulated Power Supply/ 0-5V or more Regulated Power Supply; Multimeter
2. 20 MHz Oscilloscope with Dual Channel; Bread board and components/Trainer Kit

| **B.Tech. ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **II Year – II Semester** | **0** | **0** | **2** | **1** |

### ELECTRONIC CIRCUIT ANALYSIS LABORATORY

**Note:**
- Experiments marked with * has to be designed, simulated and verified in hardware.
- Minimum of 9 experiments to be done in hardware.

**Course Outcomes:** Upon completing this course, the students will be able to
- Design power amplifiers and find its efficiency
- Design tuned amplifiers and find its Q-factor
- Design various multivibrators and sweep circuits. Understand the necessity of linearity
- Design sampling gates and understanding the concepts of frequency division

## List of Experiments (Twelve experiments to be done):

Hardware Testing in Laboratory:
1. Design transformer coupled class A power amplifier and draw the input and output waveforms find its efficiency
2. Design class B power amplifier and draw the input and output waveforms, find 2nd order and above harmonics.
3. Prove that the complementary symmetry push pull amplifier eliminate cross over distortion.
4. Design class C power amplifier and draw the input and output waveforms
5. Design a single tuned amplifier and determine the Q of its tuned circuit practically.
6. Design a Bistable Multivibrator and analyze the effect of commutating capacitors and draw the wave forms at base and collector of transistors.
7. Design an Astable Multivibrator and draw the wave forms at base and collector of transistors.
8. Design a Monostable Multivibrator and draw the input and output waveforms
9. Draw the response of Schmitt trigger for gain of greater than and less than one.
10. Design a Bootstrap sweep circuit using BJT and draw its output time base waveform
11. Design a Miller sweep circuit using BJT and draw its output time base waveform.
12. Design a constant current sweep generator and draw input and output waveforms
13. Design unidirectional and bidirectional sampling gates
14. Prove practically Schmitt Trigger generates square wave
15. Frequency division with sweep circuit Design

**Major Equipment required for Laboratories:**
1. Computer System with latest specifications connected
2. Window XP or equivalent
3. Simulation software-Multisim or any equivalent simulation software
4. Regulated Power Suppliers, 0-30V
5. 20 MHz, Dual Channel Cathode Ray Oscilloscopes.
6. Functions Generators-Sine and Square wave signals
7. Multimeters
8. Electronic Components

**B.Tech.**                                                                   **L   T   P   C**
**II Year - II Semester**                                                     **3   0   0   0**
### Gender Sensitization Lab
### (Common to ECE, CSE(AIML))

**Course Objectives:**
- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

**Course Outcomes:** The student will learn
- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labor and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

**UNIT-I:**
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 Cas

**UNIT – II:**
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:**
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:**

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:

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. **ESSENTIAL READING:** The Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

**B.Tech.ECE**                                                                 **L   T   P   C**

**III Year-I Semester**                                                         **3   1   0   4**

### MICROCONTROLLERS

**Prerequisite:** Nil

**Course Objectives:** To learn

- To familiarize the architecture of microprocessors and micro controllers
- To provide knowledge about interfacing techniques of bus & memory.
- To understand the concepts of ARM architecture
- To study the basic concepts of Advanced ARM processors

**Course Outcomes:** Upon completing this course, the student will be able to

- Understand the architecture, instruction set, and addressing modes of 8086 microprocessor and 8051 micro controllers.
- Develop assembly language programs for solving arithmetic, logical, and control-based problems on 8086/8051
- Interface microprocessors and microcontrollers with peripherals such as ADC, DAC, timers, and serial communication modules.
- Analyze real-time embedded system requirements and apply microcontroller concepts for practical applications
- Use modern tools and hardware kits to design, debug, and evaluate microprocessor/microcontroller-based systems.

### UNIT-I: 8086 Architecture

8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

**Instruction Set and Assembly Language Programming of 8086**: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

### UNIT-II: Introduction to Microcontrollers

Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

**8051 Real Time Control:** Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

### UNIT-III: I/O And Memory Interface

LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

**Serial Communication and Bus Interface:** Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

**UNIT-IV: ARM Architecture**

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

**UNIT-V: Advanced ARM Processors**

Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

**Text Books:**

1. A. K. Ray and K. M. Bhurchandani -Advanced Microprocessors and Peripherals, TMH, 2nd Edition 2006.
2. Andrew N SLOSS, Dominic SYMES, Chris WRIGHT -ARM System Developers guide, Elsevier, 2012.

**Reference Books:**

1. Kenneth. J. Ayala-The 8051 Microcontroller, Cengage Learning, 3rd Ed, 2004.
2. D. V. Hall -Microprocessors and Interfacing, TMGH, 2nd Edition, 2006.
3. K. Uma Rao, Andhe Pallavi-The 8051 Microcontrollers, Architecture and Programming and Applications, Pearson, 2009
4. Donald Reay-Digital Signal Processing and Applications with the OMAP- L138 Experimenter, WILEY 2012.

**B.Tech.ECE**                                                              **L   T   P   C**

**III Year-I Semester**                                                     **3   1   0   3**

# IOT ARCHITECTURES AND PROTOCOLS

**Prerequisite:** Nil

**Course Objectives:**
- To provide basic knowledge on IOT.
- To explain the different components and Architectures from M2M to IOT.
- To provide knowledge on different protocols of IoT.
- To impart knowledge on implementations of different protocols of IOT.

**Course Outcomes:** After completion of this course the student will be able to
- Explore the Evolution of IoT, its Growth and Applications.
- Know the components of IoT and Compare the various architectures of IoT
- Acquire knowledge on data management of IoT.
- Establish the knowledge on various IoT protocols like Data link, Network, Transport, Session, Service layers
- Understand the different components and Architectures from M2M to IoT.

## UNIT-I: IOT Introduction
Introduction and definition of IoT, Evolution of IoT, IoT growth, Application areas of IoT, Characteristics of IoT, IoT stack, Enabling technologies, IoT levels, IoT sensing and actuation, Sensing types, Actuator types.

## UNIT- II: IOT and M2M
M2M to IoT – A Basic Perspective– Introduction, Differences and similarities between M2M and IoT, SDN and NFV for IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, international driven global value chain and global information monopolies

**IOT Architecture:** IoT Architecture components, Comparing IoT Architectures, A simplified IoT Architecture, core IoT functional stack, IoT data management and compute stack

## UNIT- III: IOT Data link layer and Network layer protocols
PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z Wave, Bluetooth   Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP

## UNIT-IV: Transport and Session layer protocols
Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS) – Session Layer HTTP, CoAP, XMPP, AMQP, MQTT

## UNIT-V: Service layer protocols and Security Lasers
Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4   6LoWPAN, RPL, Application Layer.

**Text Books:**
1. Sudip Misra, Ananda up Mukherjee, Arijit Roy -Introduction to IOT, Cambridge University Press.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob barton, Jerome henry-IoT Fundamentals Networking Technologies, Protocols and Use cases for IoT", Cisco Press.

**Reference Books:**
1. Cunopfister-Getting started with the internet of things, O Reilly Media, 2011
2. Francis DaCosta, -Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications
3. Arshdeep Bahga, Vijay Madisetti -Internet of Things A Hands-on approach, Universities
4. Press Shriram K Vasudevan, RMD Sundaram, Abhishek S Nagarajan-Internet of things, John Wiley and Sons.
5. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers

**B.Tech.ECE**

| | L | T | P | C |
|---|---|---|---|---|

**III Year-I Semester**            **3**   **1**   **0**   **4**

# CONTROL SYSTEMS

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

**Course Objectives:**

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response

- To assess the system performance using time domain analysis and methods for improving it

- To assess the system performance using frequency domain analysis and techniques for improving the performance

- To design various controllers and compensators to improve system performance.

**Course Outcomes:** At the end of this course, students will demonstrate the ability to

- Model the linear-time-invariant systems using transfer function and state-space representations

- Understand the concept of stability and its assessment for linear-time invariant systems

- Design simple feedback controllers.

- Estimate the system performance using time domain analysis and methods for improving it

- Estimate the system performance using frequency domain analysis and techniques for improving the performance

**UNIT-I**: **Introduction to Control Problem**

Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems.

**Feedback Control:** Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

**UNIT-II: 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**: **Frequency-Response Analysis**

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**: **Introduction to Controller Design**

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

**UNIT-V**: **State Variable Analysis and Concepts of State Variables**

State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete time systems. Stability of linear discrete-time systems.

**Text Books:**
1. M. Gopal, -Control Systems: Principles and Design, McGraw Hill Education, 1997.
2. B. C. Kuo, -Automatic Control System, Prentice Hall, 1995.

**Reference Books:**
1. K. Ogata=Modern Control Engineering, Prentice Hall, 1991.
2. I. J. Nagrath and M. Gopal-Control Systems Engineering, New Age International, 2009.

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year-I Semester** | **3** | **0** | **0** | **3** |

# BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

**Course Objectives:**
- To learn the basic business types, impact of the economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

**Course Outcomes:** The students will understand
- The students will understand the various Forms of Business and the impact of economic variables on the Business.
- Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing elasticity of demand and supply
- Recognize the Production function, features of Iso-Quants and Iso-Costs, Market Structure, Pricing aspects are learnt.
- The students can study the firm's financial position by analyzing the Financial Statements of a Company
- Evaluate different types of financial ratios knowing liquidity, solvency and profitability position of business.

**UNIT-I**: **Introduction to Business and Economics**

**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

**UNIT-II: Demand and Supply Analysis: Elasticity of Demand**

Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply Function & Law of Supply

**UNIT-III**: **Production, Cost, Market Structures & Pricing: Production Analysis**

Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly,

Oligopoly, Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

## UNIT-IV: Financial Accounting

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

## UNIT-V: Financial Analysis through Ratios

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

**Text Books:**

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.

2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.

3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

**Reference Books:**

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.

2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

**B.Tech.ECE** **L** **T** **P**

**III Year-I Semester** **3** **0** **0**

## COMPUTER ORGANIZATION & OPERATING SYSTEMS (PE-I)

**Course Objectives:**
- To learn the basic business types, impact of the economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

**Course Outcomes:** After completion of this course the student will be able to
- Visualize the organization of different blocks in a computer.
- Utilize the micro-level operations to control different units in a computer.
- Understanding the concepts of I/O and memory organization and operating systems
- Implement Operating systems in a computer.
- Understand how to communicate with I/O devices and the organization of I/O systems

## UNIT-I: Basic Structure of Computers

Computer Types, Functional Unit, Basic operational Concepts Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation.

**Register Transfer Language and Micro Operations:** Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions – Instruction Cycle, Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

## UNIT-II: Micro Programmed Control

Control Memory, Address Sequencing, Micro program Examples, Design of Control Unit, Hard Wired Control, Micro programmed Control

**The Memory System**: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories Secondary Storage, Introduction to RAID

## UNIT-III: Input-Output Organization

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input –Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE 1394.

**UNIT-IV: Operating Systems Overview**

Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation

**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows

**Principles of Deadlock:** System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

**UNIT - V File System Interface:**

The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

**File System Implementation:** File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

**Text Books:**

1. Carl Hamacher, Zvonks Vranesic, Safea Zaky - Computer Organization, 5th Edition, McGraw Hill.

2. M. Moris Mano -Computer Systems Architecture, 3rd Edition, Pearson

3. Abraham Silberchatz, Peter B. Galvin, Greg Gagne -Operating System Concepts, 8th Edition, John Wiley.

**Reference Books:**

1. William Stallings- Computer Organization and Architecture, 6th Edition, Pearson

2. Andrew S. Tanenbaum -Structured Computer Organization, 4th Edition, PHI

3. Sivaraman Dandamudi - Fundamentals of Computer Organization and Design, Springer Int. Edition.

4. Stallings -Operating Systems – Internals and Design Principles, 6th Edition, Pearson Education, 2009.

5. Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI.

6. Principles of Operating Systems, B.L. Stuart, Cengage Learning, India Edition..

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year-I Semester** | **3** | **0** | **0** | **3** |

### DATA COMMUNICATIONS AND COMPUTER NETWORKS (PE-I)

**Pre-requisite:** Digital Communications

**Course Objectives:**
- To introduce the Fundamentals of data communication networks
- To demonstrate the Functions of various protocols of Data link layer.
- To demonstrate Functioning of various Routing protocols.
- To introduce the Functions of various Transport layer protocols.
- To understand the significance of application layer protocols.

**Course Outcomes:** Upon completing this course, the student will be able to
- Explain the fundamental concepts of data communication, transmission media, and network models.
- Analyze error detection/correction techniques and apply channel access protocols for efficient data transmission.
- Demonstrate the working principles of switching techniques, routing algorithms, and congestion control mechanisms
- Explain transport layer protocols, connection management, and flow control mechanisms in computer networks.
- Evaluate network performance, quality-of-service metrics, and compare various wired/wireless network architectures.

### UNIT-I: Introduction to Data Communications

Components, Data Representation, Data Flow, Networks Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, Wi-Fi: 802.11 Wireless LANs -The 802.11 Architecture.

### UNIT-II: Data Link Layer

Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame

### UNIT-III: The Network Layer

Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol (IP): Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol (ICMP), IPv6

### UNIT-IV: Transport Layer

Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

### UNIT - V: Application Layer

Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP, - FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages

### Text Books:

1. Kurose James F, Keith W- Computer Networking A Top-Down Approach, 6th Edition, Pearson.
2. Behrouz A. Forouzan - Data Communications and Networking, 4th Edition, McGraw-Hill Education. M. Moris Mano -Computer Systems Architecture, 3rd Edition, Pearson

### Reference Books:

1. Bhushan Trivedi - Data communication and Networks, Oxford university press, 2016
2. Andrew S Tanenbaum - Computer Networks, 4th Edition, Pearson Education
3. W. A. Shay - Understanding Communications and Networks, 3rd Edition, Cengage Learning.

**B.Tech.ECE**

**III Year-I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

### ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-I)

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

**Course Objectives:**
- It provides an understanding of various measuring system functioning and metrics for performance analysis.
- Provides understanding of principles of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Understanding the concepts of various measuring bridges and their balancing conditions.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

**Course Outcomes:** Upon completing this course, the student will be able to
- Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
- Operate an Oscilloscope to measure various signals.
- Measure various physical parameters by appropriately selecting the transducers. Design and analyze various error detection techniques.
- Design and implement signal conditioning and interfacing circuits for measurement applications.

### UNIT-I: Block Schematics of Measuring Systems

Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arson Val Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments

### UNIT-II: Signal Analyzers

AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

### UNIT-III: Oscilloscopes

CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and

Frequency Specifications.

**Special Purpose Oscilloscopes:** Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

## UNIT-IV: Transducers

Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchro's, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers

## UNIT - V: Bridges

Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

**Measurement of Physical Parameters:** Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems

## Text Books:

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D. Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

## Reference Books:

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, Dhanpati Rai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
3. Industrial Instrumentation: T.R. Padmanabhan Springer 2009.
4. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.Andrew S Tanenbaum - Computer Networks, 4th Edition, Pearson Education

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year-I Semester** | **3** | **0** | **0** | **3** |

### Signal Engineering & Automatic Train Protection-Kavach
### (Professional Elective-I)

**Prerequisites:** Physics & Mathematics, Network Layers, TDMA/FDMA/SDMA

**Course Objectives:**

- To introduce the fundamental principles of railway signaling, including signaling elements, station layouts, interlocking, and systems of train working for safe train operations.
- To impart knowledge of signaling equipment and subsystems, emphasizing fail-safe concepts, safety requirements, and signaling practices in electrified railway sections.
- To introduce train protection systems and provide in-depth knowledge of the Kavach (Indian Railways ATP) system and its architecture.
- To explain the working and interaction of onboard, wayside, and stationary subsystems of Kavach.
- To train students in designing, simulating, testing, and validating Kavach system configurations using plans, control tables, and a test bench

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

- Explain and analyze railway signaling principles, elements, station layouts, and interlocking systems to ensure safe train operations.
- Apply knowledge of signaling equipment and fail-safe concepts to real-time railway scenarios with emphasis on safety and reliability.
- Explain the concepts, needs, architecture, and working of train protection systems, including Kavach and its onboard and stationary subsystems.
- Analyze Kavach operational concepts such as train positioning, movement authority, braking curves, and speed monitoring.
- Design, simulate, verify, and validate Kavach scheme plans, control tables, interface diagrams, and system configurations using a test bench

**UNIT-I : Introduction to General Signaling and Railway Signaling**

**Opening of Railways:** Signalling and Inter locking Installations, Catechism for Signalling and Interlocking Installations, for 25KV AC, Isolation, Ruling gradients, Slip, Catch sidings

**General Rules:** Definitions, Type of Signals; Adequate Distance, System of Working, Absolute Block system, Automatic Block System, Block Working, Level Crossings, Station Working Rules

**Station Layouts:** MACLS, Signal Aspects, Location of Signals; Station Layouts: Single Line, Double Line, 2-Road,3-Road,4-Road

**Station Layouts:** Track Circuits & Axle Counters, Block Instruments, Relay Inter locking; and Electronic Inter locking, Requirement of Signaling in 25KV AC Electrified Area.

**Signaling Interlocking Plan:** Essentials of Interlocking, Train Detection, Level Crossing Gate, Point Switching, Signal, Block Control, Aspect Control Chart

## UNIT-II: Signaling Equipment

Details of Relays, Signal Cables. Signals, Control Panel &Operation–Safety features, Working, Details of Point Machines-Components, Working, Circuit Progression, Testing, Safety features, Level Crossing Gates–Working, Circuit Progression, Safety features, Details of Track Circuits, Axle Counters– Single section, Multi-section, Subsystems; Working and Application, Details about Block Instruments - Types, Working, Circuit Progression, safety features, Data Acquisition System–Interfaces, Fault logic, Details of Integrated Power Supply, CLS Panel, Lightning and Surge Protection

## UNIT-III: Introduction to Train Protection Systems -Kavach

**Train Protection Systems:** Auxiliary Warning Systems, European Train Control Systems Communication, Spot and Continuous Relay of Information, Working of Interfaces Subsystem: Onboard Kavach: Driver Machine Interlocking, Braking Interface, Radio Equipment, On board Computer, Transponder Receiver, Odometry, GNSS, GPRS, GSM
**Subsystem: Stationary Kavach:** Station Kavach, Track Side Equipment, signaling Interface, Radio & Tower, GNSS, Transponders, Network Monitoring System
**Concepts:** Location Referencing–Train position, Modes of Onboard subsystem, Train Characteristics, Mode Transitions, Braking Curves, Speed Profiles, Communication Protocols, Key Management System(KMS), Messages & Language

## UNIT-IV: Design-Kavach &Installation

**Station Design:** Kavach Scheme Plan, Kavach Control Table, Signaling Interface Diagram, Connectivity Plans for Remote Interface Units (RIUs), Power Supply Plan
**Tower Design:** Soil Testing, Foundation design, Super Structure Design
**Stationary Kavach:** Inter locking Interface, RFID Tags, Station Master Operation Console Indication Panel (SM_OCIP),GPS/GSM Antennas, Pre-commissioning Checklist, Testing, On board Kavach

## UNIT-V: Simulation

Test bench, Preparation and deployment of Stationary Kavach Data: Configuration involving Topographical Information–Arrangement of Signals/Markers, Transponders, Inter signal Distances, Signal Routes, Gradients, Speed Restrictions ; Verification and Validation of On-board Data–Ceiling.

**Text Books:**
1. Indian Railway Signal Engineering Vol-1, 2008, Pramod P Goel, Bahri Publishers
2. Indian Railway Signal Engineering Vol-IV, 2010, Pramod P Goel, Bahri Publishers
3. Kavach Cab Signalling and Automatic Train Protection Systems for Digital Railways,2023, Lalit Kumar Mansukhani, Chandra Kishore Prasad, Y, Ramesh babu, BS Publications

**Reference Books:**

1. Fundamentals of Railway Signalling,2016, C.R. Sengupta, Citadel

2. Electronics Interlocking on Indian Railways, 2018,V, Purna Chandra Rao, Notion Press.

**B.Tech.ECE**

**III Year I Semester**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

## MICROCONTROLLERS LABORATORY

**Course Outcomes:** Upon completing this course, the students will be able to

- Develop assembly language programs using 8086 microprocessors for arithmetic, logical, and string operations.
- Interface peripheral devices (ADC, DAC, Stepper Motor, Keyboard Display) with 8086 and verify their operation.
- Write embedded C programs for 8051 microcontrollers using timers, counters, I/O ports, and serial communication
- Design and implement real-time applications using microprocessor and microcontroller interfacing techniques
- Use simulation/debugging tools (Keil, MASM, Proteus, etc.) to analyze and test microprocessor/microcontroller programs.

**Cycle 1:** Using 8086 Processor Kits and/or Assembler

- Assembly Language Programs to 8086 to Perform
    1. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data.
    2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

**Cycle 2:** Using 8051 Microcontroller Kit

- Introduction to IDE
    1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
    2. Time delay Generation Using Timers of 8051.
    3. Serial Communication from / to 8051 to / from I/O devices.
    4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer 0 8051 in 8 bit Auto reload Mode and Connect a 1 HZ Pulse to INT1 pin and Display on Port 0. Assume Crystal Frequency as 11.0592 MHZ

**Cycle 3:** Interfacing I/O Devices to 8051

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8-bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

**Cycle 4:** Experiments to be carried out on Cortex-M3 development boards and using GNU toolchain7 Segment Display to 8051.

1. Blink an LED with software delay, delay generated using the SysTick timer.
2. System clock real time alteration using the PLL modules.
3. Control intensity of an LED using PWM implemented in software and hardware.
4. Control an LED using switch by polling method, by interrupt method and flash the LED once every five switch presses.

**B.Tech.ECE**                                                                          **L     T     P     C**

**III Year-I Semester**                                                          **0     0     2     1**

## ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

**Course Outcomes:** Upon completing this course, the students will be able to:

- Implement basic data communication concepts such as encoding, error detection, and error correction techniques.

- Simulate and analyze network topologies, LAN protocols, routing algorithms, and congestion control mechanisms using tools like NS2/NS3/Wireshark/Cisco Packet Tracer.

- Configure networking devices such as routers, switches, DHCP, DNS, and firewalls for small network setups

- Implement socket programming for TCP and UDP communication and evaluate performance parameters like throughput and delay.

- Work in teams to design, test, and troubleshoot mini-network prototypes and document experimental results effectively

1.  **Introduction**

    The introduction of the Advanced English Communication Skills Lab is considered essential at the B. Tech 3rd year level. At this stage, the students need to prepare themselves for their career which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

    The proposed course should be a laboratory course to enable students to use appropriate English and perform the following:

    1.  Gathering ideas and information to organize ideas relevantly and coherently.
    2.  Making oral presentations.
    3.  Writing formal letters.
    4.  Transferring information from non-verbal to verbal texts and vice-versa.
    5.  Writing project/research reports/technical reports.
    6.  Participating in group discussions.
    7.  Engaging in debates.
    8.  Facing interviews.
    9.  Taking part in social and professional communication.

2.  **Objectives:**

    This Lab focuses on using multi-media instruction for language development to meet the following targets:

    - To improve the students' fluency in English, with a focus on vocabulary

    - To enable them to listen to English spoken at normal conversational speed by educated English speakers

    - To respond appropriately in different socio-cultural and professional contexts

- To communicate their ideas relevantly and coherently in writing
- Preparing the students for placements

3. **Syllabus:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Listening and Reading Comprehension**: Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Subskills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading —— Reading Comprehension – Exercises for Practice.

2. **Activities on Writing Skills:** Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing – Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

3. **Activities on Presentation Skills** - Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation

4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies – Exercises for Practice.

5. **Interview Skills:** Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews

4. **Minimum Requirement**:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:
Spacious room with appropriate acoustics

- Round Tables with movable chairs
- Audio-visual aids

- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. **Suggested Software**:

The software consisting of the prescribed topics elaborated above should be procured and used.

- TOEFL& GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS) Oxford Advanced Learner's Dictionary, 10th Edition
- Cambridge Advanced Learner's Dictionary
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech

6. **Books Recommended:**

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). Engineering English. Orient Black Swan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5th Edition). Routledge.
4. Koneru, Aruna. (2016). Professional Communication. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). Technical Communication, Principles and Practice. (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). Technical Communication. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). English Vocabulary in Use Series. Cambridge University Press
8. Sen, Leela. (2009). Communication Skills. PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). Writing with Power. Oxford University Press.
10. Goleman, Daniel. (2013). Emotional Intelligence: Why can it matter more than IQ. Bloomsbury Publishing

**B.Tech.ECE**                                                          **L    T    P    C**

**III Year I Semester**                                                **0    0    2    1**

## IOT ARCHITECTURE AND PROTOCOLS LABORATORY

**Course Outcomes:** Upon completing this course, the students will be able to:

- Understand the fundamentals of IoT, analyzing different architectures and protocols
- Utilize the different sensors like room temperature, DHT, Humidity etc.,
- Interface the sensors and processor for transmission of data.
- Capture the images and process it on Arduino/NodeMCU/Raspberry Pi.
- know the utilization of various protocols like I2c, UART communication etc.,

**List of Experiments:**

1. Demonstrate blinking of an LED every 5 seconds and control brightness of an LED.

2. Read Humidity and Room Temperature using DHT sensor and display the readings.

3. Send the recorded values of Temperature/Humidity to the Internet via GSM module using Arduino/NodeMCU/Raspberry Pi.

4. Demonstrate Interfacing NodeMCU/Raspberry Pi with the Cloud using REST API and MQTT protocol.

5. Demonstrate Switching lights on /off remotely using Arduino/NodeMCU/Raspberry Pi.

6. Voice-based Home Automation for switching lights on/off using Google Assistant, IFTTT and MQTT.

7. Interfacing DHT11 sensor with Raspberry pi/equivalent and uploading temperature and humidity values to the cloud.

8. Design an obstacle detection unit using ultrasonic sensor.

9. Capture images from web camera using Raspberry Pi/equivalent and apply filters in increase image quality.

10. Access a remote computer from Raspberry Pi and display the remote screen.

11. Design an automatic water sprinkler based on soil moisture using Arduino/NodeMCU/Raspberry Pi.

12. Design an RFID based attendance system using Arduino/NodeMCU/Raspberry Pi.

13. Write an Arduino program to demonstrate interrupts

14. Write an Arduino program to demonstrate UART communication protocol

15. Write an Arduino program to demonstrate I2C communication protocol

16. Write an Arduino program to demonstrate SPI communication protocol.

**B.Tech.ECE**

| | **L** | **T** | **P** | **C** |
|---|---|---|---|---|

**III Year-I Semester**          **3**   **0**   **0**   **0**

### INTELLECTUAL PROPERTY RIGHTS

**Course Objectives**:
- Significance of intellectual property and its protection
- Introducing various forms of intellectual property

**Course Outcomes:**
- Explain the fundamental concepts, scope, and significance of Intellectual Property Rights in engineering and innovation.
- Differentiate among various types of IPR—Patents, Copyrights, Trademarks, Industrial Designs, and Trade Secrets
- Describe patent filing procedures, international IPR frameworks, and mechanisms for IP protection
- Apply IPR rules related to infringement, licensing, and technology transfer in real-world engineering scenarios.
- Evaluate ethical, legal, societal, and entrepreneurial implications of Intellectual Property Rights in global contexts.

### UNIT-I: Introduction to Intellectual property

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

### UNIT-II: Trade Marks

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trademarks, trade mark registration processes

### UNIT-III: Law of copyrights

Fundamental of copyright law, originality of material, rights of reproduction, rights to perform the work publicly, copyright ownership issues, copyright registration, notice of copyright, International copyright law.

**Law of patents:** Foundation of patent law, patent searching process, ownership rights and transfer

### UNIT-IV: Trade Secrets

Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, trade secret litigation. Unfair competition: Misappropriation of the right of publicity, false advertising.

### UNIT – V: New development of intellectual property

New developments in trade mark law; copyright law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copyright law, international patent law, and international development in trade secrets law.

**Text Books:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

**Reference Books:**

1. Intellectual property right – Unleashing the knowledge economy, Prabuddha Ganguli, Tata McGraw Hill Publishing company ltd.

**B.Tech.ECE**                                                             **L   T   P   C**

**III Year-II Semester**                                               **3   0   0   3**

## ANTENNAS AND WAVE PROPAGATION

**Pre-requisite:** Electromagnetic Theory and Transmission Lines

**Course Objectives:** The course objectives are:

- To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.

- To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.

- To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.

- To understand the concepts and set-up requirements for microwave measurements and familiarize with the procedure to enable antenna measurements.

- To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved

**Course outcomes:** Upon completing this course, the student will be able to

- Explain the mechanism of radiation, definitions of different antenna characteristic parameters and establish their mathematical relations.

- Analyze and characterize antennas based on operating frequency, geometry, and construct radiation patterns for various antennas and arrays.

- Demonstrate and evaluate antenna measurement setups for far-field pattern and gain determination.

- Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagation, and estimate the parameters involved

- Design and analyze antennas using modern simulation tools and evaluate their performance for specific communication applications

### UNIT-I: Antenna Basics

Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

**Thin Linear Wire Antennas** – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Field of Small Loop and Short

Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

## UNIT-II: Antenna Arrays

Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays.

**Antenna Measurements:** Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

## UNIT-III: VHF, UHF and Microwave Antennas - I

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

## UNIT-IV: VHF, UHF and Microwave Antennas - II

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

## UNIT-V: Wave Propagation

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts,

**Ground Wave Propagation –**Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

**Space Wave Propagation** –Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

**Sky Wave Propagation** –Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation

**Text Books:**

1. J.D. Kraus, R.J. Marhefka and Ahmad S. Khan -Antennas and Wave Propagation, 4th ed., (Special Indian Edition), TMH, New Delhi, 2010.
2. E.C. Jordan and K.G. Balmain -Electromagnetic Waves and Radiating Systems, PHI, 2nd ed., P2000

**Reference Books:**

1. C.A. Balanis - Antenna Theory, 3rd Edition. John Wiley & Sons, 2005.
2. K.D. Prasad, Satya Prakashan - Antennas and Wave Propagation, Tech India Publications, New Delhi, 2001.
3. Keith Henney - Radio Engineering Handbook, 3rd edition TMH.
4. John Leonidas Volakis -Antenna Engineering Handbook, 3rd edition, 2007G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

**B.Tech.ECE**                                                      **L  T  P  C**

**III Year-II Semester**                                            **3  0  0  3**

# DIGITAL SIGNAL PROCESSING

**Prerequisite:** Signals and Systems

**Course Objectives**:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To understand the fast computation of DFT and appreciate the FFT processing.
- To study the designs and structures of digital (IIR and FIR) filters and analyze and synthesize for a given specification.
- To acquaint in Multi-rate signal processing techniques and finite word length effects.

**Course Outcomes**: Upon completing this course, the student will be able to Students will

- Students will be able to understand LTI system characteristics and Multi rate signal processing.
- Students will be able to represent inter-relationship between DFT and various transforms.
- Students will be able to design a digital IIR filter for a given specification.
- Students will be able to design a digital FIR filter for a given specification.
- Students will be able to acknowledge the significance of various filter structures and effects of round off errors.

## UNIT-I: Introduction:

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

**Multi rate Digital Signal Processing:** Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

## UNIT–II Discrete Fourier series:

Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z Transform.

**Fast Fourier Transforms:** Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

## UNIT-III: IIR Digital Filters

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

## UNIT-IV: FIR Digital Filters

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

## UNIT-V: Realization of Digital Filters

Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

**Finite Word Length Effects:** Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

## Text Books:

1. A. V. Oppenheim and R.W. Schaffer - Discrete Time Signal Processing, PHI, 2009
2. John G. Prokes, Dimitris G. Manolakis - Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, 2007.

## Reference Books:

1. Li Tan - Digital Signal Processing – Fundamentals and Applications, Elsevier, 2008
2. Robert J. Schilling, Sandra L. Harris - Fundamentals of Digital Signal Processing using MATLAB, Thomson, 2007
3. S. Saliva Hanan, A. Vallavaraj and C. Ghanapriya - Digital Signal Processing, TMH, 2009
4. Emmanuel C. Ifeachor and Barrie W. Jervis - Digital Signal Processing - A Practical approach, 2 Nd Edition, Pearson Education, 2009

**B.Tech.ECE**                                                                                                  **L    T    P    C**
**III Year-II Semester**                                                                                    **3    0    0    3**

## CMOS VLSI DESIGN

**Prerequisite:** Electronic Circuit Analysis; Switching Theory and Logic Design **Course Objectives:** The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs.
- Explain electrical properties of MOS and Bi CMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits

**Course Outcomes:** Upon completing this course, the student will be able to

- Understand MOS transistor theory, fabrication process, and electrical characteristics used in VLSI design
- Analyze CMOS logic styles, circuit design principles, and performance metrics such as delay, power, and noise.
- Design combinational and sequential logic circuits using CMOS technology and optimize for area, speed, and power.
- Apply VLSI design methodology, including layout design rules, stick diagrams, and transistor-level implementation
- Use EDA tools (Cadence/Mentor/DSCH/Micro wind) to simulate, verify, and evaluate VLSI circuits and systems.

## UNIT-I: Introduction
Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &Bi CMOS
**Basic Electrical Properties:** Basic Electrical Properties of MOS and Bi CMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

## UNIT-II: VLSI Circuit Design Processes
VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

## UNIT–III: Gate Level Design
Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

## UNIT-IV: Data Path Subsystems
Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.
**Array Subsystems:** SRAM, DRAM, ROM, Serial Access Memories.

**UNIT-V: Programmable Logic Devices**

Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs. CMOS Testing: CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

**Text Books:**
1. Kamran Eshraghian, Eshraghian Dougles and A. Puck Nell - Essentials of VLSI circuits and systems, PHI, 2005
2. Neil H. E Weste, David Harris, Ayan Banerjee - CMOS VLSI Design – A Circuits and Systems Perspective, 3rd Edition, Pearson, 2009.

**Reference Books:**
1. Ming-BO Lin - Introduction to VLSI Systems: A Logic, Circuit and System Perspective, CRC Press, 2011
2. John. P. Uyemura - CMOS logic circuit Design, Springer, 2007.
3. Wayne Wolf - Modern VLSI Design, 3rd Edition, Pearson Education, 1997.
4. K. Lal Kishore, V. S. V. Prabhakar -VLSI Design, I.K International, 2009.

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year-II Semester** | **3** | **0** | **0** | **3** |

### DIGITAL IMAGE PROCESSING (PE – II)

**Prerequisite:** Digital Signal Processing

**Course Objectives:**

- To provide an approach towards image processing and introduction about 2D transforms
- To expertise about enhancement methods in time and frequency domain
- To expertise about segmentation and compression techniques
- To understand the Morphological operations on an image

**Course Outcomes:** Upon completing this course, the student will be able to

- Explore the fundamental relations between pixels and utility of 2-D transforms in image processer.
- Articulate the enhancement, segmentation and restoration processes on an image.
- Implement the various Morphological operations on an image
- Utilize basic compression algorithms
- Apply image restoration, segmentation, and compression techniques to digital images.

### UNIT-I: Digital Image Fundamentals & Image Transforms

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.
**Image Transforms**: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

### UNIT-II: Image Enhancement (Spatial Domain)

Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering.
**Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

### UNIT-III: Image Restoration

Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

### UNIT-IV: Image Segmentation

Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.
**Morphological Image Processing**: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

**UNIT-V: Image Compression**

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

**Text Books:**
1. Rafael C. Gonzalez, Richard E. Woods -Digital Image Processing, 3rd Edition, Pearson, 2008
2. S Jayaraman, S Sakurajima, T Veerakumar - Digital Image Processing- - TMH, 2010.

**Reference Books:**
1. Scotte Umbaugh- Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools, 2nd Ed, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings - Digital Image Processing using MATLAB, 2nd Edition, TMH, 2010.
3. Somka, Hlavac, Boyle-Digital Image Processing and Computer Vision –Cengage Learning (Indian edition) 2008.
4. Adrian low- Introductory Computer Vision Imaging Techniques and Solutions-,2nd Edition, BS Publication, 2008.

**B.Tech.ECE**                                                              **L   T   P   C**

**III Year-II Semester**                                                    **3   0   0   3**

### MOBILE COMMUNICATIONS AND NETWORKS (PE-II)

**Prerequisites:** Analog and Digital Communications

**Course Objectives:**

- To provide the student with an understanding of the cellular concept, frequency reuse, handoff strategies.
- To provide the student with an understanding of Co-channel and Non-Co-Channel interferences.
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and channel assignment
- To give the student an understanding type of handoff.
- To understand challenges and application of Ad hoc wireless Networks

**Course Outcomes:** Upon completing this course, the student will be able to

- Known the evolution of cellular and mobile communication system.
- Explore the Co-Channel and Non-Co-Channel interferences.
- Known how to overcome the different fading effects
- Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoffs.
- Demonstrate the difference between cellular and Ad hoc Networks and design goals of MAC Layer protocol.

**UNIT-I**: **Introduction to Cellular Mobile Radio Systems**
Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.
**Fundamentals of Cellular Radio System Design:** Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in an Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems Cell Splitting, Sectoring, Microcell Zone Concept.

**UNIT-II: Co-Channel Interference**
Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and their effects, diversity techniques-space diversity, polarization diversity, frequency diversity, time diversity.
**Non-Co-Channel Interference**: Adjacent Channel Interference, Near end far end interference, cross talk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

**UNIT-III**: **Cell Coverage for Signal and Traffic**

Signal Reflections in flat and Hilly Terrain, effects of Human Made Structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, path loss from a point-to-point prediction model in different conditions, merits of lee model.

**Frequency Management and Channel Assignment:** Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

**UNIT- IV**: **Handoffs and Dropped Calls**

Handoff Initiation, types of Handoffs, Delaying Handoff, advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem handoff, Introduction to Dropped Call Rates and their Evaluation.

**UNIT- V**: **Ad Hoc Wireless Networks**

Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet, MAC Protocols for Ad Hoc Wireless, Introduction, issues in designing AMAC Protocol for Ad Hoc wireless Networks, Design Goals of AMAC protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols.

**Text Books:**
1. W.C.Y. Lee - Mobile Cellular Telecommunications, 2nd edition, Mc Graw Hill, 1989.
2. Theodore. S. Rapport - Wireless Communications, 2nd edition, Pearson Education, 2002.

**Reference Books:**
1. C. Siva ram Murthy and B.S. Manoj - Ad Hoc Wireless Networks: Architectures and Protocols, PHI, 2004.
2. Simon Haykin, Michael Moher - Modern Wireless Communications, Pearson Education, 2005.
3. Vijay Garg - Wireless Communications and Networking, Elsevier Publications, 2007.
4. Andrea Goldsmith -Wireless Communications-, Cambridge University Press, 2005.

**B.Tech.ECE**                                                                **L    T    P    C**

**III Year-II Semester**                                                **3    0    0    3**

### EMBEDDED SYSTEM DESIGN (PE-II)

**Prerequisites:** Microprocessors and Microcontrollers; Computer Organization and Operating Systems

**Course Objectives:**
- To provide an overview of Design Principles of Embedded System.
- To provide clear understanding about the role of firmware.
- To understand the necessity of operating systems in correlation with hardware systems.
- To learn the methods of interfacing and synchronization for tasking.

**Course Outcomes:** Upon completing this course, the student will be able to
- Understand the architecture, components, and design principles of embedded systems including hardware–software co-design.
- Analyze embedded processors, memory, buses, I/O interfaces, and real-time operating systems for various applications.
- Apply real-time constraints, scheduling algorithms, and embedded firmware development techniques.
- Design embedded system applications using microcontrollers, sensors, actuators, and communication interfaces
- Use embedded design tools (Keil, MPLAB, Arduino/ARM IDEs) to model, simulate, and evaluate embedded applications

### UNIT-I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

### UNIT-II: Typical Embedded System

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

### UNIT-III: Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

### UNIT- IV: RTOS Based Embedded System Design

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

**UNIT- V: Task Communication**

Shared Memory, Message Passing, Remote Procedure Call and Sockets

**Task Synchronization:** Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

**Text Books:**
1. Shibu K.V - Introduction to Embedded Systems, Mc Graw Hill.

**Reference Books:**
1. Raj Kamal - Embedded Systems, TMH.
2. Frank Vahid, Tony Givargis - Embedded System Design, John Wiley.
3. Lyla - Embedded Systems, Pearson, 2013
4. David E. Simon - An Embedded Software Primer, Pearson Education, 2007.

**B.Tech.ECE**                                                    **L    T    P    C**

**III Year-II Semester**                                          **3    0    0    3**

### FUNDAMENTALS OF INTERNET OF THINGS (OE – I)

**Course Objectives:** The objectives of the course are to:
- Make concepts of Internet of Things understandable to build IoT applications.
- Teach the programming and use of Arduino and Raspberry Pi boards.
- provide Knowledge about data handling and analytics in SDN.

**Course Outcomes:** Upon completing this course, the students will be able to
- Know basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.

## UNIT – I Introduction to Internet of Things:
Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

## UNIT - II Machine-to-Machine Communications:
Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

## UNIT – III Introduction to Python programming:
Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

## UNIT - IV Implementation of IoT with Raspberry Pi:
Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

## UNIT - V Cloud Computing:
Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.
Case Study: Agriculture, Healthcare, Activity Monitoring

**TEXT BOOKS:**
1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Make sensors": Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.
   "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

**REFERENCE BOOKS:**

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
   Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

**B.Tech.ECE**

**III Year-II Semester**

| | L | T | P | C |
|---|---|---|---|---|
| | 3 | 0 | 0 | 3 |

### PRINCIPLES OF SIGNAL PROCESSING (OE- I)

**Course Objectives:**

- To give the basics of Signals and Systems required for all Engineering related courses.
- To provide the basic characteristics of LTI systems.
- To provide knowledge on signal transmission requirements.
- To give basic understanding of signal statistical properties and noise source concepts.

**Course Outcomes:** Upon completing this course, the students will be able to

- Differentiate various signal functions.
- Understand the characteristics of linear time invariant systems.
- Understand the concepts of sampling theorem and signal to noise ratios.
- Determine the Spectral and temporal characteristics of Signals.

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

**UNIT - II Signal Transmission through Linear Systems Linear System:**
Impulse response, Response of a Linear System, 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, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution.

**UNIT – III Sampling theorem:**
Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

**UNIT - IV Temporal characteristics of signals:**
Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Time Averages and Ergodicity, Cross Correlation and Auto Correlation of Functions, Properties of Correlation Functions, Cross-Correlation Function and Its Properties, Power Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function.

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

properties.

**TEXT BOOKS:**
1. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2013.
2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4 th Ed., 2001.

**REFERENCE BOOKS:**
1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.
2. Fundamentals of Signals and Systems - Michel J. Robert, MGH, 2008.
3. Random Processes for Engineers-Bruce Hajck, Cambridge unipress, 2015
4. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

**B.Tech.ECE**

| | L | T | P | C |
|---|---|---|---|---|
| **III Year-II Semester** | 3 | 0 | 0 | 3 |

### DIGITAL ELECTRONICS FOR ENGINEERING (OE-I)

**Course Objectives:**

- To provide basic understanding of properties and theorems of Boolean Algebra.
- To provide knowledge on logic gates and universal gates.
- To teach techniques to reduce the Boolean expressions using K map.
- To give introduction to Logic families and different types Integrated circuits.

**Course Outcomes:** Upon completing this course, the students will be able to

- Get basic knowledge on logic gates, Universal gates and their switching logics.
- Realize Boolean expressions using NAND/NOR gates and reduce them using K map.
- Know all types of combinational and sequential circuits.
- Acquire knowledge on realization of logic families using diodes and transistor, and also on different types of integrated circuits.

### UNIT I: Number Systems:

Number systems, Complements of Numbers, Codes- Weighted and Non- weighted codes and its Properties. Boolean Algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebraic Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

### UNIT - II Minimization of Boolean functions:

Karnaugh Map Method - Up to four Variables, Don't Care Map Entries, Tabular Method, Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free Relations.

### UNIT – III Sequential Circuits Fundamentals:

Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Fundamentals of shift registers, ripple and decade counters.

### UNIT - IV Realization of Logic Gates Using Diodes & Transistors:

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL, CML and CMOS Logic Families and its Comparison, standard TTL NAND Gate Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate,

### UNIT - V Integrated Circuits:

Classification, chip size and circuit complexity, basic information of Op- amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 opamp and its features, modes of operation-inverting, non-inverting, differential.

**TEXT BOOKS:**
1. Switching and Finite Automata Theory - ZviKohavi& Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3rd Edition, 2007- Tata McGraw-Hill
3. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
4. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

**REFERENCE BOOKS:**
1. Digital Design- Morris Mano, PHI, 4th Edition,2006
2. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI
3. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH.

**B.Tech.ECE** **L** **T** **P** **C**

**III Year-II Semester** **0** **0** **2** **1**

## DIGITAL SIGNAL PROCESSING LABORATORY

**Course Outcomes:** Upon completing this course, the student will be able to

- Implement basic DSP operations (convolution, correlation, DFT/IDFT, FFT/IFFT) using MATLAB / Python / DSP processors

- Design and analyze digital IIR and FIR filters using standard techniques and verify the responses through simulation

- Develop real-time DSP applications using DSP kits / processors and evaluate system performance.

- Implement sampling, quantization, and multi rate signal processing concepts in software/hardware.

- Prepare technical reports and demonstrate DSP experiments effectively through oral presentation

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

**Note: - Minimum of 12 experiments must be conducted**.

**List of Experiments:**

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s)
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

**B.Tech.ECE**

| | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year-II Semester** | **0** | **0** | **2** | **1** |

<div align="center">

**CMOS VLSI DESIGN LABORATORY**

</div>

**Note:** Any **SIX** of the following experiments from each part are to be conducted (Total 12)

**Course Outcomes:** Upon completing this course, the student will be able to

- Understand the physical design process of Digital Integrated Circuits
- Describe procedure for designing of programmable circuits.
- Demonstrate the ability to use various EDA tools for digital system design
- Implement various combinational and sequential circuits using VHDL on FPGA
- Implement schematic and layout of various digital CMOS logic circuits using EDA tools.

**Part - I**

**All the following experiments must be implemented using HDL**

1. Realize all the logic gates
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder
3. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer
4. Design of 4 bit binary to gray code converter
5. Design of 4-bit comparator
6. Design of Full adder using 3 modeling styles
7. Design of flip flops: SR, D, JK, T
8. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
9. Finite State Machine Design

**Part - II**

**Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis for the following:**

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/ NAND gates
4. CMOS XOR and MUX gates
5. Static / Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate)

**B.Tech.ECE**                                                                                          **L   T   P   C**

**III Year-II Semester**                                                                          **0   0   2   1**

<div align="center"><b>ADVANCED COMMUNICATIONS LABORATORY</b></div>

**Course Outcomes:**
- The ability to analyse and simulate antenna performance
- Generation of different types of signals using Vector Signal Generator
- Study the features of Network and spectrum analyzer
- Simulate the Radiation resistance for different antennas using HFSS/ ADS/ MATLAB and compare the measurement using Network analyzer
- Reading analog and digital sensors data using UART Using ICONT setup.

**Note: Minimum Eight experiments should be conducted**

**List of Experiments:**
1. Study the features of Network and spectrum analyzer
2. Simulate the Radiation pattern for different antennas using HFSS/ADS/MAT LAB and compare the measurement using Network analyzer.
    i. Dipole Antenna
    ii. Horn antenna
    iii. Microstrip Antenna etc.
3. Simulate the Radiation resistance for different antennas using HFSS/ ADS/ MATLAB and compare the measurement using Network analyzer.
    i. Dipole Antenna
    ii. Horn antenna
    iii. Microstrip Antenna etc.
4. Plotting eye diagram for baseband signal using MATLAB and verifying using Network analyzer.
5. Plotting Constellation Diagram of QAM using MATLAB and verify using kit.
6. OFDM generation and detection using Simulink and verify using kit.
7. Generation of different types of signals using Vector Signal Generator
8. Modulation analysis on digital modulated single carrier signals using MAT LAB.
9. Reading analog and digital sensors data using UART Using ICONT setup.
10. Collecting sensor values of remote nodes using RIME broadcasting Using ICONT setup.

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **III Year-II Semester** | **3** | **0** | **0** | **3** |

## ENVIRONMENTAL SCIENCE

**Course Objectives:**
- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures
- Understanding the environmental policies and regulations.

**Course Outcomes:** Based on this course, the Engineering graduate will
- Explain the structure and functions of ecosystems and the importance of natural resources
- Identify and analyze environmental pollution types, causes, and control measures.
- Interpret environmental policies, acts, and sustainable development practices.
- Recognize the impact of human activities on biodiversity and propose conservation strategies.
- Demonstrate awareness of environmental ethics, green technologies, and global environmental issues.

### UNIT-I: Ecosystems

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

### UNIT-II: Natural Resources

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

### UNIT-III: Biodiversity And Biotic Resources

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

### UNIT- IV: Environmental Pollution and Control Technologies Environmental Pollution:

Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of

pollution, drinking water quality standards.

**Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil.

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

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

## UNIT - V Environmental Policy, Legislation & EIA:

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

**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 life style

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

**B. Tech (ECE)**          **L**    **T**    **P**    **C**

**IV Year-I Semester**          **3**    **1**    **0**    **4**

**MICROWAVE AND OPTICAL COMMUNICATIONS (PC)**

**Prerequisite**: Antennas and Propagation.

**Course Objectives:** To learn
- To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
- To distinguish between different types of microwave tubes, their structures and principles of microwave power generation.
- To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S Matrix for various types of microwave junctions.
- Understand the utility of Optical Fibers in Communications.

**Course outcomes:** Upon completing this course, the student will be able to
- Known power generation at microwave frequencies and derive the performance characteristics.
- Realize the need for solid state microwave sources and understand the principles of solid-state devices.
- Distinguish between the different types of waveguide and ferrite components, and select proper components for engineering applications
- Measure the S-parameters in microwave component design.
- Demonstrate the mechanism of light propagation through Optical Fibers

**UNIT-I: Microwave Tubes**

Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes: 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics.

**Helix TWTs:** Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

**UNIT-II: M-Type Tubes**

Introduction, Crossfield Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI Mode, o/p characteristics, Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, Principle of operation of IMPATT and TRAPATT Devices

### UNIT-III: Waveguide Components

Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions - E plane and H plane Tees. Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator,

### UNIT-IV: Scattering matrix

Scattering Matrix Properties, Directional Couplers – 2 Hole, Bethe Hole, [s] matrix of Magic Tee and Circulator.

**Microwave Measurements:** Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Measurement of Attenuation, Frequency. Standing Wave Measurements, measurement of Low and High VSWR, Cavity Q, Impedance Measurements. Cauchy-Riemann equations

### UNIT-V: Optical Fiber Transmission Media

Optical Fiber types, Light Propagation, Optical fiber Configurations, Optical fiber classifications, Losses in Optical Fiber cables, Light Sources, Optical Sources, Light Detectors, LASERS, WDM Concepts, Optical Fiber System link budget.

### Text Books:

1. Samuel Y. Liao -Microwave Devices and Circuits, 3rd Edition, Pearson, 2003.

2. Wayne Tomasi- Electronic Communications Systems, 5th Edition, Pearson,

### Reference Books:

1. Gerd Keiser - Optical Fiber Communication, 4th Edition, TMH, 2008.

2. David M. Pozar - Microwave Engineering – 3rd edition, John Wiley & Sons (Asia) Pvt Ltd., 2011 Reprint.

3. G.S. Raghuvanshi - Microwave Engineering, Cengage Learning India Pvt. Ltd., 2012.

4. George Kennedy - Electronic Communication System, 6th Edition, McGraw Hill.

**B.Tech.ECE** **L  T  P  C**

**IV Year–I Semester** **3  0  0  3**

### RADAR SYSTEMS (PE – III)

**Prerequisite:** Analog and Digital Communications

**Course Objectives:**
- To explore the concepts of radar and its frequency bands.
- To understand Doppler effect and get acquainted with the working principles of CW radar, FMCW radar.
- To impart the knowledge of functioning of MTI and Tracking Radars.
- To explain the designing of a Matched Filter in radar receivers.

**Course Outcomes:** Upon completing this course, the student will be able to
- Derive the complete radar range equation.
- Familiarize the functioning of CW, FM-CW and MTI radars
- Known various Tracking methods.
- Derive the matched filter response characteristics for radar receivers
- Understand the concepts of radar and its frequency bands.

### UNIT-I: Basics of Radar
Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation.

**Radar Equation:** SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment)

### UNIT-II: CW and Frequency Modulated Radar
Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

**FM-CW Radar:** Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

### UNIT-III: MTI and Pulse Doppler Radar
Principle, MTI Radar - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

### UNIT-IV: Tracking Radar
Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

**UNIT-V: Detection of Radar Signals in Noise**

Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

**Radar Receivers –** Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

**Text Books:**

1. Merrill I. Skolnik- Introduction to Radar Systems, 2nd Edition, TMH Special Indian Edition, 2007.

**Reference Books:**

1. Byron Edde - Radar: Principles, Technology, Applications, Pearson Education, 2004.
2. Peebles, Jr., P.Z., Wiley - Radar Principles, New York, 1998.
3. Mark A. Richards, James A. Scheer, William A. Holm, Yes Dee - Principles of Modern Radar: Basic Principles, 2013
4. Merrill I. Skolnik -Radar Handbook, 3rd Edition., McGraw-Hill Education, 2008.

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–I Semester** | **3** | **0** | **0** | **3** |

## CMOS ANALOG IC DESIGN (PE - III)

**Pre-Requisite**: Analog Electronics

**Course Objectives:** Analog circuits play a very crucial role in all electronic systems and due to continued miniaturization, many of the analog blocks are not getting realized in CMOS technology.

- To understand most important building blocks of all CMOS Analog ICs.
- To study the basic principle of operation, the circuit choices and the trade-offs involved in the MOS transistor level design are common to all Analog CMOS ICs.
- To understand specific design issues related to single and multistage voltage, current and differential amplifiers, their output and impedance issues, bandwidth, feedback and stability.
- To understand the design of differential amplifiers, current amplifiers and OPAMPs

**Course Outcomes:** After studying the course, each student is expected to be able to

- Design basic building blocks of CMOS Analog ICs.
- Carry out the design of single and two stage operational amplifiers and voltage references.
- Determine the device dimensions of each MOSFETs involved
- Design various amplifiers like differential, current and operational amplifiers.
- Analyze the effects of noise, mismatch, and process variations on CMOS analog circuit performance.

### UNIT-I: **MOS Devices and Modeling**

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

### UNIT-II: **Analog CMOS Sub-Circuits**

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors- Current mirror with Beta Helper, Degeneration, Cascade current Mirror and Wilson Current Mirror, Current and Voltage References, Bandgap Reference.

### UNIT-III: **CMOS Amplifiers**

Inverters, Differential Amplifiers, Cascade Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

**UNIT-IV: CMOS Operational Amplifiers**

Design of CMOS Op-Amps, Compensation of Op-Amps, Design of Two-Stage Op-Amps, Power Supply, Rejection Ratio of Two-Stage Op-Amps, Cascade Op-Amps, Measurement Techniques of OP Amp.

**UNIT–V: Comparators**

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

**Text Books:**

1. Philip E. Allemand Douglas, R. Holberg – CMOS Analog Circuit Design, Oxford University Press, International Second Edition/Indian Edition, 2010.
2. Paul R. Gray, Paul J. Hurst, S. Lewis and R.G. Meyer -Analysis and Design of Analog Integrated Circuits, 5th edition, Wiley India, 2010.

**Reference Books:**

1. David A. Johns, Ken Martin- Analog Integrated Circuit Design, Wiley Student Edn, 2013.
2. Behzad Razavi – Design of Analog CMOS Integrated Circuits, TMH.
3. Baker, Liand Boyce - CMOS: Circuit
4. Design, Layout and Simulation, PHI.

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–I Semester** | **3** | **0** | **0** | **3** |

## ARTIFICIAL NEURAL NETWORKS (PE – III)

**Prerequisite: Nil**

**Course Objectives:**

- To understand the biological neural network and to model equivalent neuron models.
- To understand architecture, learning algorithms
- To know the issues of various feed forward and feedback neural networks.
- To explore the Neuro dynamic models for various problems.

**Course Outcomes:** Upon completing this course, the student will be able to

- Explore the similarity of Biological networks and Neural networks
- Perform the training of neural networks using various learning rules.
- Demonstrate the concepts of forward and backward propagations.
- Construct Hopfield models.

### UNIT-I: **Introduction**
A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks
**Learning Process:** Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

### UNIT-II: Single Layer Perceptron's
Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment
**Multilayer Perceptron:** Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

### UNIT-III: **Back Propagation**
Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning.

### UNIT -IV: Self-Organization Maps (SOM)
Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature    Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

**UNIT–V: Neuro Dynamics**

Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm

**Hopfield Models –** Hopfield Models, restricted boltzmen machine.

**Text Books:**

1. Simon S Haykin - Neural Networks a Comprehensive Foundations, PHI
2. Jacek M. Zurada - Introduction to Artificial Neural Systems, JAICO Publishing House, 2006.

**Reference Books:**

1. Li Min Fu - Neural Networks in Computer Intelligence, TMH 2003
2. James A Freeman David M S Kapura - Neural Networks, Pearson, 2004.
3. B. Vegnanarayana -Artificial Neural Networks, Prentice Hall of India P Ltd, 2005

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–I Semester** | **3** | **0** | **0** | **3** |

## NETWORK SECURITY AND CRYPTOGRAPHY (PE – IV)

**Prerequisite: Nil**

**Course Objectives:**
- Understand the basic concept of Cryptography and Network Security, their mathematical models
- To understand the necessity of network security, threats/vulnerabilities to networks and counter measures
- To understand Authentication functions with Message Authentication Codes and Hash Functions.
- To provide familiarity in Intrusion detection and Firewall Design Principles.

**Course Outcomes:** Upon completing this course, the student will be able to
- Describe network security fundamental concepts and principles
- Encrypt and decrypt messages using block ciphers and network security technology and protocols
- Analyze key agreement algorithms to identify their weaknesses
- Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities.
- Identify and evaluate security vulnerabilities, attacks, and countermeasures in computer networks.

**UNIT -I**:

Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.
**Modern Techniques:** Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

**UNIT-II: Encryption**

Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

**UNIT-III**: **Public Key Cryptography**

Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.
**Number Theory:** Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.,

**UNIT-IV: Message Authentication and Hash Functions**

Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

**Hash and Mac Algorithms:** MD-5, Message digest Algorithm, Secure Hash Algorithm. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

**Authentication Applications:** Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME

**UNIT–V: IP Security**

Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management.

Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

**Intruders, Viruses and Worms:** Intruders, Viruses and Related threats.

**Fire Walls:** Fire wall Design Principles, Trusted systems.

**Text Books:**

1. William Stallings-Cryptography and Network Security: Principles and Practice, Pearson Education.
2. Robert Bragg, Mark Rhodes -Network Security: The complete reference, TMH, 2004.

**Reference Books:**

1. William Stallings - Network Security Essentials (Applications and Standards), Pearson Education.
2. Eric Maiwald - Fundamentals of Network Security, Dream tech press
3. Whitman - Principles of Information Security, Thomson.
4. Buchmann - Introduction to Cryptography, Springer.

**B.Tech.ECE**                                                                **L     T     P     C**

**IV Year–I Semester**                                                    **3     0     0     3**

### SATELLITE COMMUNICATIONS (PE – IV)

**Prerequisite:** Analog and Digital Communications

**Course Objectives:**

- To acquire foundation in orbital mechanics and launch vehicles for satellites
- To provide basic knowledge of link design of satellite.
- To understand multiple access systems and earth station technology
- To understand the concepts of satellite navigation and GPS.

**Course Outcomes:** Upon completing this course, the student will be able to

- Explore the basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.

- Envision the satellite sub systems and design satellite links for specified C/N.

- Familiarize the various multiple access techniques for satellite communication systems and earth station technologies.

- Known the concepts of LEO, GEO Stationary Satellite Systems and satellite navigation

- Known Tracking Systems, Terrestrial Interface.

### UNIT -I: Introduction

Origin of Satellite Communications, Historical Background, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

**Orbital Mechanics and Launchers:** Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance

### UNIT-II: Satellite Subsystems

Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification

**UNIT-III**: **Satellite Link Design**

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

**Multiple Access:** Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms

**UNIT-IV: Earth Station Technology**

Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

**UNIT–V: Low Earth Orbit and Geo-Stationary Satellite Systems**

Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.
**LEO-**Introduction, Origin of LEO, Low-Latency Communication in LEO Systems, Beamforming & Phased Array Antennas for LEO, Security Challenges in LEO Satellite Networks, LEO Satellites for 5G & 6G Integration.

**Text Books:**

1. Timothy Pratt, Charles Bostian and Jeremy Allnutt - Satellite Communications, WSE, Wiley Publications, 2nd Edition, 2003.

**2.** Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud - Satellite Communications Engineering, 2nd Edition, Pearson Publications, 2003

**Reference Books:**

1. M. Richharia - Satellite Communications: Design Principles, 2nd Edition, BS Publications, 2003
2. D.C Agarwal - Satellite Communication, 5th Edition, Khanna Publications,
3. K.N. Raja Rao - Fundamentals of Satellite Communications, PHI, 2004
4. Dennis Roddy - Satellite Communications, 4th Edition, McGraw Hill, 2009

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–I Semester** | **3** | **0** | **0** | **3** |

## BIOMEDICAL INSTRUMENTATION (PE – IV)

**Course Objectives:**

- **Identify** significant biological variables at cellular level and ways to acquire different bio-signals.
-  **Elucidate** the methods to monitor the activity of the heart, brain, eyes and muscles.
- **Introduce** therapeutic equipment for intensive and critical care.
- **Outline** medical imaging techniques and equipment for certain diagnosis and therapies.

**Course Outcomes:** After completion of the course the student is able to:

- Explore biosystems and medical systems from an engineering perspective.
- Identify the techniques to acquire record and primarily understand physiological activity of the human body through cell potential, ECG, EEG, BP and blood flow measurement and EMG.
-  Articulate the working of various medical instruments and critical care equipment.
- Know the imaging techniques including CT, PET, SPECT and MRI used in diagnosis of various medical conditions
- Analyse the working principles and characteristics of biomedical transducers and electrodes used for physiological measurements.

### UNIT -I: Bio-Potential Signals and Electrodes

Bio-signals and their characteristics, Organization of cell, Nernst equation of membrane, Resting and Action potentials. Bio-amplifiers, characteristics of medical instruments, problems encountered with measurements from living systems. Bio-potential electrodes – Body surface recording electrodes, Internal electrodes, micro electrodes. Bio-chemical transducers – reference electrode, the pH electrodes, Blood gas electrodes.

### UNIT-II: Cardiovascular Instrumentation

Heart and cardiovascular system Heart electrical activity, blood pressure and heart sounds. Cardiovascular measurements electro cardiography – electrocardiogram, ECG Amplifier, Electrodes and leads, ECG recorder principles. Types of ECG recorders. Principles of blood pressure and blood flow measurement

**UNIT-III**: **Neurological Instrumentation**

Neuronal communication, electro encephalogram (EEG), EEG Measurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, preamplifiers and amplifiers. EMG block diagram and Stimulators

**UNIT-IV: Equipment for Critical Care**

Therapeutic equipment - Pacemaker, Defibrillator, Shortwave diathermy, Hemodialysis machine. Respiratory Instrumentation - Mechanism of respiration, Spirometry, Pneumotachograph, Ventilators

**UNIT–V: Principles of Medical Imaging**

Radiography, computed Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Ultrasonography, Introduction to Telemedicine.

**Text Books:**
1. R.S. Khandpur - Handbook of Biomedical Instrumentation, McGraw-Hill, 2003.
2. John G. Webster = Medical Instrumentation, Application and Design, John Wiley

**Reference Books:**
1. Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer - Biomedical Instrumentation and Measurements, PHI.
2. L.A. Geodes and L.E. Baker - Principles of Applied Biomedical Instrumentation, John Wiley and Sons.
3. Joseph Carr and Brown - Introduction to Biomedical equipment technology

**B.Tech.ECE**                                                              **L    T    P    C**

**IV Year–I Semester**                                                      **3    0    0    3**

## ELECTRONIC SENSORS (OE - II)

**Course Objectives:**
- To teach the characterization of sensors.
- to provide knowledge on working of Electromechanical, Thermal, Magnetic and radiation sensors
- To provide basic Understanding of Electro analytic and smart sensors
- provide different applications of sensors.

**Course Outcomes**: Upon completing this course, the student will be able to
- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic radiation and Electro analytic sensors.
- Understand the basic concepts of Smart Sensors.
- Design a system with sensors.

## UNIT – I: Sensors / Transducers:

Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

## UNIT – II: Thermal Sensors:

Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer
,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

## UNIT- III: Magnetic sensors:

Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

## UNIT – IV: Radiation Sensors:

Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors Electro analytical Sensors: The

Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

**UNIT - V Smart Sensors**:
Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing – Sensors for environmental Monitoring

**TEXT BOOKS:**
1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

**REFERENCE BOOKS:**
1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

**B.Tech.ECE**                                                                     **L   T   P   C**

**IV Year–I Semester**                                                             **3   0   0   3**

## ELECTRONICS FOR HEALTH CARE (OE-II)

**Course Objective:**
- To provide knowledge on Health care data
- To demonstrate need of Electronics in Health Care.
- To give basic knowledge on electronic equipments used in medical field.

**Course Outcomes:** Upon completion of this course, the students will be able to
- Know about health care data and its conversion to information and to knowledge.
- Acquire knowledge on (Electronic Health Records) EHRs and their Implementation.
- Understand the working of electronic devices used for the patient monitoring.
- Know the concepts of Telemedicine and therapeutic devices used inside the human body

**UNIT - I: Health care data, Information and Knowledge**:
Definitions and Concepts, Converting Data to Information to Knowledge, Clinical Data Warehouses, What makes Health Informatics Difficult, Why Health IT fails Sometimes, Terminology of Analytics, Challenges to Data Analytics, Research and application of analytics, Role of Informatics in analytics.

**UNIT - II: Electronic Health Records**:
Introduction, Need for Electronic Health Records, Institute of Medicine's Vision for EHRs, Electronic Health Record Key Component, Electronic Prescribing, Electronic Health Record Adoption, Electronic Health Record Adoption and Meaningful use Challenges, Electronic Health Record Examples, Logical Steps to Selecting and Implementing an EHR

**UNIT- III: Patient Monitoring Systems**:
System Concepts, Cardiac Monitor, Bedside Patient Monitoring Systems, Central Monitors, Measurement of Heart Rate, Measurement of Pulse Rate, Blood Pressure Measurement, Measurement of Temperature, Measurement of Respiration Rate, Catheterization Laboratory Instrumentation.

**UNIT- IV: Biomedical Telemetry and Telemedicine**:
Wireless Telemetry, Single Channel Telemetry Systems, Multi-channel Wireless Telemetry Systems, Multi-patient Telemetry, Implantable Telemetry Systems, Transmission of Analog Physiological Signals, Over Telephone, Telemedicine.

**UNIT- V: Therapeutic devices:**
Need for Cardiac Pacemaker, Implantable Pacemakers, DC Defibrillator, Electronics in the Anaesthetic Machine.

**TEXT BOOKS:**

1. Robret E. Hoyt MD FACP "Health Informatics" sixth edition 2007.
2. R. S. Kandpur "Biomedical Instrumentation Technology and Applications" second edition Tata McGraw-Hill.

**REFERENCE BOOKS:**

1. Edward H. Shortlliffe, James J.Cimino "Biomedical Informatics, Computer applications in Health care and Biomedicine**"** third edition Springer.
2. G.V.R.K. Acharyulu, Bhimaraya Metri, L. Kalyan Viswanath REDDY "Health care and Hospital Management Contemporary Issues and Strategies".

| | | | |
|---|---|---|---|
| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
| **IV Year–I Semester** | **3** | **0** | **0** | **3** |

## TELECOMMUNICATIONS FOR SOCIETY (OE - II)

**Course Objectives:**
- To introduce Telecommunications and its vast development.
- To give knowledge on voice, Data and image transmission.
- To treat with different types of noise/distortions that occur during transmissions.
- To make topics like TV transmission by satellite and broadcasting understandable**.**

**Course Outcomes:** Upon completion of this course, the students will be able to
- Understand the concepts of simplex, half duplex, and full duplex of one-way and two-way circuits.
- Get knowledge on subscriber loop design and VF repeaters of voice telephony.
- Get brief overview of video transmission and its broadcasting standardsin television transmission.
- Know different of modes of television transmission**.**

### UNIT - I:
**Introductory Topics in Telecommunications:** End-Users, Nodes, and Connectivities, Telephone Numbering and Routing, Use Of Tandem Switches in aLocal Area Connectivity, Introduction to the Busy Hour and Grade Of Service, Simplex, Half-Duplex, and Full Duplex, One-Way and Two-Way Circuits, Network Topologies, Variations in Traffic Flow, Quality Of Service, Standardization in Telecommunications, The Organization of the PSTN in the United States, Points Of Presence.

### UNIT - II:
**Quality of Service and Telecommunication Impairments:** Objective, Quality of Service: Voice, Data, and Image, Signal-to-Noise Ratio, Voice Transmission, Data Circuits, Video (Television), The Three Basic Impairments and How They Affect the End-User, Amplitude Distortion, Phase Distortion, Noise Level, Typical Levels, Echo and Singing.

### UNIT - III:
**Transmission Aspects of Voice Telephony:** Definition of the Voice Channel, Operation of the Telephone Subset, Subscriber Loop Design, Design of Local Area Wire-Pair Trunks (Junctions), VF Repeaters (Amplifiers).

### UNIT - IV:
**Television Transmission:** Background and Objectives, An Appreciation of Video Transmission, Critical Video Parameters, Video Transmission Standards (Criteria for Broadcasters), Methods of Program Channel Transmission, The Transmission of Video

Over LOS Microwave, TV Transmission by Satellite Relay, Digital Television, Conference Television, Brief Overview of Frame Transport for Video Conferencing.

**UNIT - V:**

**Community Antenna Television (Cable Television):** Objective and Scope, The Evolution of CATV, System Impairments and Performance Measures, Hybrid Fiber-Coax (HFC) Systems, DigitalTransmission of CATV Signals, Two-Way CATV Systems, Two-Way Voice and Data over CATV Systems Based on the DOCSIS 2.0 Specification, Subsplit/Extended Subsplit Frequency Plan, Other General Information.

**TEXT BOOKS:**

1. Roger L. Freeman "Fundamentals of Telecommunications" 2$^{nd}$ Edition, John Wiley & Sons Publications 2005.
2. Annabel Z. Dodd "The Essential Guide to Telecommunications" 5$^{th}$Edition , Prentice Hall 2012.

**REFERENCE BOOKS:**

1. JYRKI T. J. PENTTINEN "THE TELECOMMUNICATIONS HANDBOOK" John Wiley & Sons Publications 2015.

2. Prof. Dr. Muhammad EL-SABA "Telecommunications systems and data networks" 3$^{rd}$ Edition 2015.

**B.Tech.ECE**                            **L**    **T**    **P**    **C**

**IV Year–I Semester**                      **2**    **0**    **0**    **2**

# PROFESSIONAL PRACTICE, LAW AND ETHICS

**Course Objectives:**
- To make the students understand the types of roles they are expected to play in society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession.

**Course Outcomes:** The students will
- Understand the concepts of professional practice, ethics, and responsibilities of engineers in society.

- Explain the legal framework of contracts**,** including formation, performance, and remedies for breach.

- Analyze and apply the procedures for arbitration, conciliation, and other alternative dispute resolution mechanisms in engineering practic**e.**

- Interpret and apply various labour, industrial, and construction-related laws (RERA, BOCW, Industrial Acts) in professional scenarios.

- Evaluate the importance of Intellectual Property Rights (IPR) and their relevance in protecting engineering innovations

## UNIT -I: Professional Practice and Ethics
Definition of Ethics, Professional Ethics - Engineering Ethics, Personal Ethics; Code of Ethics - Profession, Professionalism, Professional Responsibility, Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures. Introduction to GST- Various Roles of Various Stake holders

## UNIT-II: Law of Contract
Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Contract of Contract of Contract of Sale.

## UNIT-III: Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system
Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance;

Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalat's.

## UNIT-IV: Engagement of Labour and Labour & other construction-related Laws

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other - Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017., Spirometry, Pneumotachograph, Ventilators.

## UNIT–V: Law relating to Intellectual property

Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970

## Text Books:

1. R. Subramanian - Professional Ethics, Oxford University Press, 2015.
2. Ravinder Kaur - Legal Aspects of Business, 4th edition, Cengage Learning, 2016

## Reference Books:

1. RERA Act, 2017.
2. Wadhera - Intellectual Property Rights, Universal Law Publishing Co., 2004.
3. T. Ramappa - Intellectual Property Rights Law in India, Asia Law House, 2010.
4. O.P. Malhotra - Law of Industrial Disputes, N.M. Tripathi Publishers

**B.Tech.ECE** **L T P C**

**IV Year–I Semester** **0 0 4 2**

## MICROWAVE AND OPTICAL COMMUNICATIONS LABORATORY

**Course Outcomes:**

- Demonstrate the characteristics and working principles of microwave components such as the Reflex Klystron, Gunn diode, and directional coupler
- Measure and analyze microwave parameters including attenuation, frequency, impedance, and VSWR using standard techniques.
- Examine and evaluate the scattering parameters (S-parameters) of waveguide components for understanding signal behavior in microwave systems
- Analyze the characteristics and performance of optoelectronic devices such as LEDs and Laser diodes and demonstrate their use in optical communication links.
- Determine key parameters of optical fiber communication systems such as numerical aperture, data rate, and link losses to assess system efficiency.

**Note: Any twelve of the following experiments**

**List of Experiments**

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation measurement
4. Directional coupler Characteristics.
5. Scattering parameters of wave guide components
6. Frequency measurement.
7. Impedance measurement
8. VSWR measurement
9. Characterization of LED.
10. Characterization of Laser Diode.
11. Intensity modulation of Laser output through an optical fiber.
12. Measurement of Data rate for Digital Optical link.
13. Measurement of Numerical Aperture of fiber cable.
14. Measurement of losses for Optical link

| **B.Tech. ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–II Semester** | **3** | **0** | **0** | **3** |

## ARTIFICIAL INTELLIGENCE (PE – V)

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

- To impart knowledge about Artificial Intelligence.

- To give understanding of the main abstractions and reasoning for intelligent systems.

- To enable the students to understand the basic principles of Artificial Intelligence in various applications

**Course Outcomes:** Upon completing this course, the students will be able to

- Understand the basics of the theory and about intelligent agents.

- Capable of using heuristic searches, aware of knowledge-based systems and expert systems.

- Apply AI techniques to real-world problems to develop intelligent systems.

- Select appropriately from a range of techniques when implementing intelligent systems

- Analyze the ethical, societal, and practical implications of Artificial Intelligence solutions and evaluate their limitations in real-world applications.

### UNIT -I: Introduction

Introduction–Definition – foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation

### UNIT-II: Problem Solving Methods

Problem solving Methods – Search Strategies- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions

### UNIT-III: Knowledge Representation

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

**UNIT-IV: Knowledge Acquisition**

Introduction to Learning, Rule Induction, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning. Learning Using neural Networks, Probabilistic Learning Natural Language Processing

**UNIT–V: Expert systems**

Introduction, basic concepts, structure of expert systems, the human element in expert systems how expert systems work, problem areas addressed by expert systems, expert systems success factors, types of expert systems, expert systems and the internet interact web, model-based reasoning, case-based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty.

**Text Books:**
1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education
2. David Poole, Alan Mackworth, Randy Goebel," Computational Intelligence: a logical approach", Oxford University Press.

**Reference Books:**
1. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
2. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

**B.Tech.ECE**

**IV Year–II Semester**

| | L | T | P | C |
|---|---|---|---|---|
| | 3 | 0 | 0 | 3 |

## 5G AND BEYOND COMMUNICATIONS (PE-V)

**Course Objectives:**

- Enable students to understand the evolution and fundamentals of wireless communication systems, emphasizing 5G.

- Develop knowledge of 5G architecture, protocols, and radio access technologies.

- Provide analytical skills related to key enabling technologies such as massive MIMO, mm Wave, beamforming, and network slicing.

- Expose students to performance requirements, use cases, and applications of 5G systems.

- Introduce students to future research directions in beyond-5G and 6G communications

**Course Outcomes:**

- Explain the evolution and basic principles of wireless communication systems up to 5G

- Describe the 5G NR architecture, protocol stack, and core network functions

- Analyze key enabling technologies such as massive MIMO, mm Wave, and beamforming

- Evaluate 5G performance metrics and service requirements for e MBB, URLLC, and Mm tc

- Apply 5G concepts to real-world applications such as IoT, smart cities, and autonomous systems.

## UNIT -I: Multiple Input Multiple Output (MIMO) Communications

Spatial Multiplexing, Spatial Diversity, Beamforming in MIMO systems, Hybrid Precoding, 5G Communication Landscape, Related work on 5G.

## UNIT-II: Introduction to Mobile Wireless Technology Generations5G

WISDOM, GIMVC, Requirements of 5G, standardization of WISDOM, Vision of 5G, WISDOM Concept and Challenges, Cellular D2D Communication, D2D Using Physical Layer Network Coding, Using FFR and Using Cognitive Radio. SMNAT: Introduction, Network Architecture and the Process, Implementation of SMNAT for In-BandD2D and Interoperability with WISDOM, Description of Network elements of SMNAT and Call Flow for Session Establishment

## UNIT-III: Radio Wave Propagation for Mm Wave

Introduction, Large-scale Propagation Channel Effects, Small-Scale Channel Effects, Spatial Characterization of Multipath and Beam Combing, Outdoor Channel Models, Indoor Channel Models

**UNIT-IV: Higher layer Design Considerations for Mm Wave**

Challenges when Networking Mm Wave Devices, Beam Adaptation Protocols, Relaying for Coverage Extension, Support for Multimedia Transmission, Multiband considerations, Performance of Cellular networks, Mm Wave Standardization: ECMA-387, IEEE 802.11ad..

**UNIT–V: BEYOND 2020**

Major Challenges Surrounding Future Cyber Security, Users Awareness, Spectrum Related Security Issues in CRNs. Challenges for 2020 and beyond, Future Mobile Technologies, High Altitude Stratospheric Platform Station Systems, Human Bond Communications, CONASENSE. based reasoning, explanation & meta knowledge inference with uncertainty representing uncertainty

**Text Books:**

1. Ramjee Prasad, 5G: 2020 and Beyond, River Publishers
2. T. S. Rappaport, R. W. Heath Jr., R. C. Daniels, and J. M. Murdock, Millimeter Wave Wireless Communication, Pearson Education, 2015.

**B.Tech.ECE**

| | L | T | P | C |
|---|---|---|---|---|
| **IV Year–II Semester** | 3 | 0 | 0 | 3 |

## MACHINE LEARNING (PE – V)

**Course Objectives:**
- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

**Course Outcomes:**
- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications
- Identify challenges, ethical issues, and future trends in machine learning

### UNIT -I: Artificial Neural Networks
Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

### UNIT-II: Unsupervised Learning Network
Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks

### UNIT-III: Linear Models
Linear Basis Function Models -Maximum likelihood and least squares, Geometry of least squares , Sequential learning, Regularized least squares, Multiple outputs , The Bias-Variance Decomposition, Bayesian Linear Regression -Parameter distribution, Predictive, Equivalent, Bayesian Model Comparison, Probabilistic Generative Models-Continuous inputs, Maximum likelihood solution, Discrete features, Exponential family, Probabilistic Discriminative Models -Fixed basis functions, Logistic regression, Iterative reweighted least squares, Multiclass logistic regression, Probit regression, Canonical link functions.

### UNIT-IV: Kernel Methods
Constructing Kernels, Radial Basis Function Networks - Nadaraya-Watson model,  Gaussian Processes -Linear regression revisited, Gaussian processes for regression, Learning the hyper parameters, Automatic relevance determination, Gaussian processes for classification, Laplace approximation, Connection to neural networks, Sparse Kernel Machines- Maximum Margin Classifiers, Overlapping class distributions, Relation to logistic regression, Multiclass SVMs, SVMs for regression, Computational learning theory, Relevance Vector Machines- RVM for

regression, Analysis of sparsity, RVM for classification

**UNIT–V: Graphical Models**

Bayesian Networks, Example: Polynomial regression, Generative models, Discrete variables, Linear-Gaussian models, Conditional Independence- Three example graphs, D-separation, Markov Random Fields -Conditional independence properties, Factorization properties, Illustration: Image de-noising, Relation to directed graphs, Inference in Graphical Models- Inference on a chain, Trees, Factor graphs, The sum-product algorithm, The max-sum algorithm, Exact inference in general graphs, Loopy belief propagation, Learning the graph structure..

**Text Books:**

1. C. Bishop -Pattern Recognition and Machine Learning- -Springer, 2006.
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

**Reference Books:**

1. Nils J. Nilsson -Introduction to machine learning, Stanford University Stanford.
2. William J. Deuschle – Undergraduate Fundamentals of Machine Learning, thesis Harvard College, Cambridge.
3. Shai Shalev-Shwartz, Shai Ben-David- Understanding Machine Learning, From theory to Algorithms, Cambridge University press, 2014

**B.Tech.ECE**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**IV Year–II Semester**

## MULTIMEDIA DATABASE MANAGEMENT SYSTEMS (PE – VI)

**Prerequisite: Data Structures**

**Course Objectives:**
- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques

**Course Outcomes:**
- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques
- Design and implement multimedia database queries and applications using appropriate tool

### UNIT -I: Database System Applications

A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

**Introduction to Database Design**: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model.

### UNIT-II: Introduction to the Relational Model

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus

### UNIT-III: SQL Queries, Constraints, Triggers:

form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

**Schema Refinement:** Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

### UNIT-IV:

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with

Concurrent Transactions

**UNIT–V:**

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure

**Text Books:**
1. Database Management Systems, Raghu ram Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition

**Reference Books:**
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Narrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S. Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–II Semester** | **3** | **0** | **0** | **3** |

## SYSTEM ON CHIP ARCHITECTURE (PE – VI)

**Prerequisite:** Embedded System Design

**Course Objectives:**

- To introduce the architectural features of system on chip.
- To imbibe the knowledge of customization using case studies

**Course Outcomes:**

- Expected to understand SOC Architectural features
- To acquire knowledge on processor selection criteria and limitations
- To acquires knowledge of memory architecture on SOC.
- To understands the interconnection strategies and their customization on SOC
- Demonstrate the capability to design and analyze reconfigurable parallel architectures for specific computational tasks

### UNIT -I: Introduction to the System Approach

System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity

### UNIT-II: Processors

Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

### UNIT-III: Memory Design for SOC

Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation, SOC Memory System, Models of Simple Processor – memory interaction.

### UNIT-IV: Interconnect Customization

Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization:

**UNIT–V: Configuration**

An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism

**Text Books:**

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiley India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

**Reference Books:**

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer

2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newness, BK and CDROM

3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–II Semester** | **3** | **0** | **0** | **3** |

## WIRELESS SENSOR NETWORKS (PE – V)

**Prerequisite: Analogue and Digital Communications**

**Course Objectives:**
- To acquire the knowledge about various architectures and applications of Sensor Networks
- To understand issues, challenges and emerging technologies for wireless sensor networks
- To learn about various routing protocols and MAC Protocols
- To understand various data gathering and data dissemination methods
- To Study about design principals, node architecture, hardware and software required for implementation of wireless sensor networks

**Course Outcomes:** Upon completion of the course, the student will be able to:
- Analyze and compare various architectures of Wireless Sensor Networks
- Understand Design issues and challenges in wireless sensor networks
- Analyze and compare various data gathering and data dissemination methods.
- Design, Simulate and Compare the performance of various routing and MAC protocol
- Apply localization, time synchronization, and coverage techniques in sensor networks.

**UNIT -I:**

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

**UNIT-II:**

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

**UNIT-III:**

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

**UNIT-IV:**

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols

**UNIT–V:**

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to Tiny OS and nesC

**Text Books:**

1. V Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy, B. S. Manoj, Pearson
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE

**Reference Books:**

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
4. Wireless Communication and Networking – William Stallings, 2003, PHI.

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–II Semester** | **3** | **0** | **0** | **3** |

## MEASURING INSTRUMENTS (OE - III)

**Course Objectives:**
- To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
- To provide better familiarity with the concepts of Sensors and Measurements.
- To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, force, pressure and viscosity.

**Course Outcomes**: Upon Completion of this course the student is
- Able to identify suitable sensors and transducers for real time applications.
- Able to translate theoretical concepts into working models.
- Able to understand the basics of measuring devices and use them in relevant situation.

**UNIT-I Introduction to measurements**:
Physical measurement, Forms and methods of measurements, Measurement errors, Statistical analysis of measurement data, Probability of errors, Limiting errors, Standards, Definition of standard units, International standards, Primary standards, Secondary standards, Working standards, Voltage standard, Resistance standard, Current standard, Capacitance standard, Time and frequency standards.

**UNIT - II Passive Sensors Resistive Sensors**:
Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers, Capacitive Sensors: Variable capacitor, Differential capacitor, Inductive Sensors: Reluctance variation sensors, Eddy current sensors.

**UNIT - III Metrology**:

Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge Blocks, Optical Methods for length and distance measurements. Velocity and Acceleration Measurement: Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods, Accelerometers- different types, Gyroscopes-applications.

**UNIT - IV Force and Pressure Measurement**:
Gyroscopic Force Measurement – Vibrating wire Force transducer. Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High- and Low-Pressure measurement

**UNIT - V Flow:**
Density and Viscosity Measurements: Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, Density measurements – Strain

Gauge load cell method – Buoyancy method. Units of Viscosity, Two float viscorator – Industrial consistency meter

**TEXT BOOKS:**
1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997.

**REFERENCE BOOKS:**
1. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
2. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P. Neubrat, Oxford University Press.
3. Measurement system: Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
4. Electronic Instrumentation by H.S. Kalsi.

**B.Tech.ECE** **L** **T** **P** **C**

**IV Year–II Semester** **3** **0** **0** **3**

## COMMUNICATION TECHNOLOGIES (OE-III)

**Course Objectives:**
- To give an overview of Source-Destination communication.
- To provide the different modes of communication technologies like wireless and cellular mobile networks.
- To make familiar with the generations of communications like 1G, 2G, 3G, 4G and 5G.
- To give brief explanation on security of network and its management.

**Course Outcomes:** Upon completing this course, the student will be able to
- Understand the information theory and its coding styles.
- Acquire knowledge on satellite communication and broadcasting services.
- Know GSM, LTE and 5G mobile networks.
- Know about network security through encryption and decryption.

**UNIT - I:**
**Information Theory**: Shanon Capacity, Multimedia Data, Data Processing, Boolean Logics, Information Content, Entropy, Source Coding, Channel Coding, Modulation Schemes, Internet.

**UNIT - II:**
**Wireless Communication Technologies**: WLAN, Wifi, Bluetooth, Other Wireless PAN And WAN Technologies, Satellite Communications, Broadcast Services.

**UNIT - III:**
**Cellular Mobile Networks**: GSM(2G), UMTS (3G), LTE(4G), 5G Mobile Networks, Mobile Network Planning Aspects.

**UNIT - IV:**
**Free Space Optical Communications**: Optical Fiber, FTTC, FTTH, FTTBS, Free Space Optical Link, Channel Model with Different Factors, Deep Space Optical Communications.

**UNIT - V:**
**Network Security and Management**: Symmetrical Encryption, Asymmetrical Encryption, Authentication, Hash-Value, Integrity Check, Telecommunications Management Network, SNMP, Functionalities of Network Management, Trends and Future Development.

**TEXT BOOKS:**

1. Shun-Ping Chen, "Fundamentals of Information and Communication Technologies" 2020
2. B.P. Lathi, "Communication systems"- BS Publications, 2006.

**REFERENCE BOOKS:**

1. Simon Haykin, John Wiley "Digital Communications" 2005.
2. Herbert Taub, Donald L Schilling Gautham Saha "Principles of Communication systems" 3rd edition McGraw-Hill 2008.

**Vignan's Institute of Management and Technology for Women**
**An Autonomous Institution**

| **B.Tech.ECE** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|
| **IV Year–II Semester** | **3** | **0** | **0** | **3** |

## FUNDAMENTALS OF SOCIAL NETWORKS (OE-III)

**Course Objectives:**

- To give overview on social networks.
- To make social media, information networks and world wide web concepts more familiar.
- To provide knowledge on social network ties.
- To provide knowledge on power laws related to information networks.

**Course Outcomes:** upon completing this course the students will be able to

- Understand concepts like small-world experiment and snowball sampling related to social networks.
- Get knowledge on ties, weak ties and their strength.
- Know about structure of the web, modern web search, link analysis using hubs.
- Acquire knowledge on power laws and analysis of Rich-get-Richer phenomena.
- Identify ethical, privacy, and security issues associated with social networks.

### UNIT -I: Introduction to social networks
The Empirical Study of Social Networks, Interviews and Questionnaires, Direct Observation, Data from Archival or Third-Party Records, Affiliation Networks, The Small-World Experiment, Snowball Sampling, Contact Tracing, and Random Walks.

### UNIT-II: Graph theory and Social Networks
Basic definitions, Paths and Connectivity, The strength of weak ties, Tie Strength and Network Structure in Large-Scale Data, Tie strength, social media, passive engagement.

### UNIT-III: Information networks and World Wide Web
The World Wide Web, Information Networks, Hypertext, and Associative Memory, The Web as a Directed Graph, The Bow-Tie Structure of the Web, the emergence of web 2.0, Searching the Web: The Problem of Ranking Link Analysis using Hubs and Authorities, PageRank, Applying Link Analysis in Modern Web Search.

### UNIT-IV: Power Laws and Rich-Get-Richer Phenomena
Popularity as a Network Phenomenon, Power Laws, Rich-Get-Richer Models, The Unpredictability of Rich-Get-Richer Effects, The Long Tail, The Effect of Search Tools and Recommendation Systems, Advanced Material: Analysis of Rich-Get Richer Processes.

### UNIT–V :The Small-World Phenomenon
Six Degrees of Separation, Structure and Randomness, Decentralized Search, Modeling the Process of Decentralized Search, Empirical Analysis and Generalized Models, Core-Periphery Structures and Difficulties in Decentralized Search, Advanced Material: Analysis of

Decentralized Search.

**Text Books:**
1. M. E. J. Newman "Networks an introduction" Oxford University Press 2010.
2. Networks, Crowds and Markets by David Easley and Jon Kleinberg, Cambridge University Press, 2010.

**Reference Books:**
1. Social and Economic Networks by Matthew O. Jackson, Princeton University Press, 2010.
2. Maksim Tsvetovat and Alexander Kouznetsov. "Social Network Analysis for Startups". O'Reilly Media, 2011.