UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
B.TECH (Electronics and Communication Engineering) - R19
EFFECTIVE FROM 2019-20 BATCHE

B. Tech COURSE STRUCTURE

For

Electronics and Communication Engineering

UNIVERSITY COLLEGE OF ENGINEERING VIZIANAGARAM
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
VIZIANAGARAM-535003, ANDHRA PRADESH, INDIA.

(Applicable for batches admitted from 2019-2020)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

I Year- I SEMESTER

S. No.	Course	Category	L	T	P	Credits
1	Communicative English	HS	3	0	0	3
2	Calculus	BS	3	0	0	3
3	Applied Physics	BS	3	0	0	3
4	Problem solving and Programming using C	ES	3	0	0	3
5	Engineering Drawing	ES	3	1	0	3
6	English Communication Skills lab	HS	0	0	3	1.5
7	Applied Physics lab	BS	0	0	3	1.5
8	Problem solving and Programming using C-lab	ES	0	0	3	1.5
9	Electronic Workshop	ES	0	0	2	1
10	Professional Ethics and Human Values	MC	3	0	0	0
11	Applied Physics-Virtual Laboratory	BS	0	0	2	0
			Sub-Total			**20.5**

I Year- II SEMESTER

S. No.	Course	Category	L	T	P	Credits
1	Linear Algebra and Numerical Methods	BS	3	0	0	3
2	Vector Calculus, Transforms and PDE	BS	3	0	0	3
3	Applied Chemistry	BS	3	0	0	3
4	Basic Electrical Engineering	ES	3	0	0	3
5	Network Analysis	ES	3	1	0	2.5
6	Advanced Communication Skills lab	HS	0	0	3	1.5
7	Applied Chemistry lab	BS	0	0	3	1.5
8	Basic Electrical Engineering lab	ES	0	0	3	1.5
9	Engineering Exploration Project-Design Thinking	PR	0	0	1	0.5
10	Constitution of India	MC	3	0	0	0
11	Physical Fitness Activities/Yoga	MC	2	0	0	0
			Sub-Total			**19.5**

II Year – I Semester **6T+2L**

S. No.	Course	Category	L	T	P	Credits
1	Electronic Devices and Circuits	PC	3	0	0	3
2	Digital Electronics	PC	3	0	0	3
3	Signals and Systems	PC	3	1	0	3
4	Complex Variables & Statistical Methods	BS	3	1	0	3
5	Random Variables and Stochastic Process	PC	3	1	0	3
6	Managerial Economics & Financial Accountancy	HS	3	0	0	3
7	Electronic Devices and Circuits - Lab	PC	0	0	3	1.5
8	Digital Electronics – Lab	PC	0	0	3	1.5
9	Intellectual Property Rights& Patents	MC	3	0	0	0
			Sub-Total			**21**

II Year – II Semester **6T+2L**

S. No.	Course	Category	L	T	P	Credits
1	Electronic Circuit Analysis	PC	3	1	0	3
2	Control Systems	PC	3	1	0	3
3	Electromagnetic Field Theory and Transmission Lines	PC	3	1	0	3
4	Analog Communications	PC	3	0	0	3
5	Computer Architecture and Organization	ES	3	0	0	3
6	Management and Organizational Behavior	HS	3	0	0	3
7	Electronic Circuit Analysis – Lab	PC	0	0	3	1.5
8	Analog Communications – Lab	PC	0	0	3	1.5
9	Environmental Science	MC	3	0	0	0
			Sub-Total			**21**

III Year – I Semester **5T+3L**

S. No.	Course	Category	L	T	P	Credits
1	Linear and Digital IC applications	PC	3	0	0	3
2	Microprocessor and Microcontrollers	PC	3	0	0	3
3	Digital Communications	PC	3	1	0	3
4	Antennas and Wave Propagation	PC	3	1	0	3
5	**Professional Elective -1**	PE	3	0	0	3
6	Linear and Digital IC applications Lab	LC	0	0	3	1.5
7	Digital Communications Lab	LC	0	0	3	1.5
8	Microprocessor and Microcontrollers - Lab	LC	0	0	3	1.5
9	Seminar	PR	3	0	0	0.5
			Sub-Total			**20**

III Year – II Semester **5T+3L**

S. No.	Course	Category	L	T	P	Credits
1	Microwave Engineering	PC	3	0	0	3
2	VLSI Design	PC	3	0	0	3
3	Digital Signal Processing	PC	3	1	0	3
4	**Professional Elective -2**	OE	3	0	0	3
5	**Open Elective -1**	OE	3	0	0	3
6	VLSI Lab (Mentor/Tanner)	LC	0	0	3	1.5
7	Digital Signal Processing Lab	LC	0	0	3	1.5
8	Microwave and Optical communication engineering - Lab	LC	0	0	3	1.5
9	Mini Project with Hardware Development	PR	0	0	3	1
			Sub-Total			**20.5**

Professional Elective -1
1. Information Theory and Coding
2. Speech and Audio Processing
3. Wireless Communication

Professional Elective -2
1. Mobile Cellular Communication
2. MIMO Communication
3. Wireless Sensor Networks

Open Elective -1
1. Computer Networks & Security
2. Fundamentals of Cloud Computing
3. IOT Engineering

IV Year – I Semester **6T+1L+1P**

S. No.	Course	Category	L	T	P	Credits
1	Radar Engineering	PC	3	0	0	3
2	Electronic Measurements & Instrumentation	PC	3	0	0	3
3	Fiber Optical Communication	PC	3	0	0	3
4	Digital Imaging and Video Processing	PC	3	0	0	3
5	**Professional Elective -3**	PE	3	0	0	3
6	**Professional Elective -4**	PE	3	0	0	3
7	Image and Video Processing lab	PC	0	0	3	1.5
8	Project - Part I	PR	0	0	3	3
			Sub-Total			**22.5**

IV Year – II Semester **2T+1P**

S. No.	Course	Category	L	T	P	Credits
1	**Professional Elective -5**	PE	3	0	0	3
2	**Open Elective -2**	OE	3	0	0	3
3	Project - Part II	PR	0	0	9	9
			Sub-Total			**15**
			Total			**160**

Total Course Credits = 40+42 + 40.50 + 37.50 = 160

Professional Elective -3
1. Embedded Systems
2. Mixed Signal Design
3. Biomedical Electronics

Professional Elective -4
1. Satellite Communication
2. Error Correcting Codes
3. Wavelets & Multirate Systems

Professional Elective -5
1. Analog IC Design
2. CMOS Design
3. Low Power VLSI

Open Elective -2
1. Machine Learning Algorithms (ANN's)
2. Optimization Techniques
3. Stastical Signal Processing

B.Tech I Year I Semester

L	T	P	C
3	0	0	3

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Unit I:

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications

Lesson-2: Deliverance by Premchand from "**The Individual Society",** Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.
Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit II:
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "**The Individual Society",** Pearson Publications. (Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.
Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.
Pronunciation: Past tense markers, word stress-di-syllabic words

Unit III:
Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "**Infotech English**", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "**The Individual Society",** Pearson Publications. (Non-detailed**)**
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.
Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words
Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.
Pronunciation: word stress-poly-syllabic words

Unit IV:
Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "**Infotech English**", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "**The Individual Society",** Pearson Publications**.** (Non-detailed)
Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.
Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms
Pronunciation: Contrastive Stress

Unit V:
Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications
Lesson-2: Still I Rise by Maya Angelou from "**The Individual Society",** Pearson Publications. (Non-detailed)
Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.
Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Course Outcomes:

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Prescribed text books:

1. "Infotech English", Maruthi Publications. (Detailed)

2. "The Individual Society", Pearson Publications. (Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. "Infotech English", Maruthi Publications. (with Compact Disc)

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students.* Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2).* CUP, 2012.

L	T	P	C
3	0	0	3

B.Tech I Year I Semester

Calculus
(Common to ALL branches)

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level

mathematics to develop the confidence and ability among the students to handle various real

world problems and their applications.

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations: (15 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form – Non-homogeneous equations of higher order with constant coefficients with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and $x^nV(x)$ – Method of Variation of parameters

Applications: Orthogonal trajectories – Electrical circuits (RL, RC, RLC) – Simple Harmonic motion.

UNIT III: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT IV: Multiple integrals: (8 hrs)

Double and Triple integrals – Change of order of integration – Change of variables.

Applications: Finding Areas and Volumes.

UNIT V: Special functions: (5 hrs)

Introduction to Improper Integrals-Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Course Outcomes:

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

- utilize mean value theorems to real life problems
- solve the differential equations related to various engineering fields
- familiarize with functions of several variables which is useful in optimization
- Apply double integration techniques in evaluating areas bounded by region
- students will also learn important tools of calculus in higher dimensions. Students will become

  familiar with 2- dimensional and 3-dimensional coordinate systems
- Conclude the use of special function in multiple integrals

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Reference Books:

1. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

L	T	P	C
3	0	0	3

B.Tech I Year I Semester

APPLIED PHYSICS

For Circuital Branches (EEE, ECE, CSE & IT)

The designed curriculum, encompassing the fundamental concepts of physical optics, electromagnetism and properties of materials, caters to the needs of ECE, CSE, EEE and IT students who require a basic understanding of the advanced courses in their respective branches.

Course Objectives:

- To **impart** knowledge in basic concepts of physics like physical optics, electromagnetism and optical fibres to understand the wave properties in the communication system.
- To **impart** knowledge concerning the electrical behaviour of dielectric materials.
- To **demonstrate** the properties of magnets.
- To **introduce** semiconductor physics to understand the charge carrier transport mechanism.

UNIT-I: Wave Optics (**10hrs)**

Interference: Principle of Superposition - Coherent Sources - Interference of Light - Interference in Thin Films (Reflected Geometry) - Newton's Rings.

Diffraction: Fraunhofer Diffraction - Fraunhofer Diffraction at a Single Slit (Qualitative) - Diffraction Grating - Grating Spectrum Analysis (Qualitative) - Resolving Power - Rayleigh's Criterion - Resolving Power of Grating.

Polarization: Polarization by Reflection - Double Refraction - Nicol Prism - Half Wave Plate and Quarter Wave Plate.

UNIT-II: Quantum Mechanics and Free Electron Theory (**9hrs)**

Quantum Mechanics: Introduction - de Broglie Hypothesis - Matter Waves and Properties - Interpretation of Wave Function - Schrödinger Time Independent and Time Dependent Wave Equations - Particle in a Box.

Free Electron Theory: Classical Free Electron Theory, Quantum Free Electron Theory and Band Theory of Solids (Postulates and Drawbacks) - Fermi Dirac Distribution Function and Temperature Dependence - Bloch's Theorem (Qualitative) - The Kronig – Penney Model (Qualitative) - Classification of Solids.

UNIT-III: Electromagnetism and Fibre Optics (**9hrs)**

Electromagnetism: Scalar and Vector Fields - Divergence and Curl of Electric and Magnetic fields - Gauss and Stokes Theorems (Statements) - Maxwell's Equations (Integral and Differential forms) - Electromagnetic Wave Propagation (Conducting and Non Conducting Media).

Fibre optics: Total Internal Reflection - Acceptance Angle - Numerical Aperture - Classification of Fibers Based on Refractive Index Profile and Modes - Block Diagram of Fiber Optic Communication.

UNIT-IV: Semiconductor Physics: (10hrs)

Intrinsic Semiconductors - Density of Charge Carriers - Electrical Conductivity - Extrinsic Semiconductors – P-type & N-type - Density of Charge Carriers - Dependence of Fermi Energy on Carrier Concentration and Temperature - Direct and Indirect Band Gap Semiconductors - Hall Effect - Hall Coefficient - Applications of Hall Effect - Drift and Diffusion Currents - Einstein's Relation.

UNIT-V: Magnetic and Dielectric Materials (10 hrs)

Magnetic Materials: Introduction - Magnetic Dipole Moment - Magnetization - Magnetic Susceptibility and Permeability - Origin of Permanent Magnetic Moment - Classification of Magnetic Materials - Domain Concept of Ferromagnetism - Hysteresis - Soft and Hard Magnetic Materials.

Dielectric Materials: Introduction - Dielectric Polarization - Dielectric Polarizability - Susceptibility and Dielectric Constant - Electronic and Ionic Polarizations (Quantitative) – Orientation Polarization (Qualitative) - Lorentz Field - Claussius–Mossotti Equation - Frequency Dependence of Polarization.

Course outcomes

The students will be able to

- **understand** the concepts of physical optics through the wave nature of light
- **analyze** the phenomenal differences between interference and diffraction through applications
- **apply** the fundamental laws of electricity and magnetism to currents and propagation of EM waves in different media
- **identify** the mechanisms of polarization in dielectrics and magnetic materials, conduction in semiconductors and propagation of light in optical fibers
- **explain** the principles of physics in dielectrics, magnetic materials and semiconductors useful to engineering applications
- **interpret** the effects of temperature on Fermi Dirac distribution function
- **summarize** various free electron theory models and classification of solids based on band theory

Text books

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics", 11th ed., S. Chand Publications, 2019
2. S.O. Pillai, Solid State Physics 8th ed., New Age International, 2018

Reference books

1. Ajoy Ghatak, "Optics", 6th Edition McGraw Hill Educaiton, 2017
2. David J. Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education, 2014
3. Charles Kittel "Introduction to Solid State Physics", Wiley Publications, 2011
4. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc Graw Hill, 2008
5. S.M. Sze "Semiconductor devices-Physics and Technology" - Wiley, 2008

L	T	P	C
3	0	0	3

B.Tech I Year I Semester

Problem Solving and Programming Using C

Course Objectives:

- To impart adequate knowledge on the need of programming languages and problem solving techniques and develop programming skills.
- To enable effective usage of Control Structures and Implement different operations on arrays.
- To Demonstrate the use of Strings and Functions.
- To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
- To understand structures and unions and illustrate the file concepts and its operations.
- To impart the Knowledge Searching and Sorting Techniques.

UNIT-I

Introduction to Computer Problem Solving: Programs and Algorithms, Computer Problem Solving
Requirements, Phases of Problem Solving, Problem Solving Strategies, Top-Down Approach, Algorithm
Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

UNIT-II

Introduction to C Programming: Introduction, Structure of a C Program, Comments, Keywords,
Identifiers, Data Types, Variables, Constants, Input/output Statements, Operators, Type Conversion.
Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else–if, switch.
Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT-III

Arrays: Introduction, Operations on Arrays, Arrays as Function Arguments, Two dimensional Arrays,
Multi dimensional arrays.
Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and
Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

UNIT-IV

Functions: Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes, Recursion.

Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT-V

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type –enum variables, Using Typedef keyword, Bit Fields.

Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Course Outcomes:

At the end of the Course, Student will be able to:

 Illustrate the Fundamental concepts of Computers and basics of computer programming.

 Use Control Structures and Arrays in solving complex problems.

 Develop modular program aspects and Strings fundamentals.

 Demonstrate the ideas of pointers usage.

 Solve real world problems using the concept of Structures, Unions and File operations.

Text Books:

1. How to solve it by Computer, R. G. Dromey, and Pearson Education.
2. Computer Programming, Reema Thareja, Oxford University Press.

Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Programming In C A-Practial Approach, Ajay Mittal, Pearson.
3. C Programming – A Problem Solving Approach, Forouzan, Gilberg, Cengage.
4. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
5. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.
6. Let us C , Yaswanth Kanetkar, 16

Web Links:

th

Edition,BPB Publication.

1. http://www.c4learn.com/
2. http://www.geeksforgeeks.org/c/
3. http://nptel.ac.in/courses/122104019/
4. http://www.learn-c.org/
5. https://www.tutorialspoint.com/cprogramming/

L	T	P	C
3	0	0	3

B.Tech I Year I Semester

Engineering Drawing

Course Objective:

- Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Introduction to Engineering graphics.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit II

Objective: The objective is to make the students draw the projections of the plane and solids inclined to both the reference planes.

Projections of planes: Construction of polygons, regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane, plane objects/ inclined to both the reference plane.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders – simple positions.

Unit III

Objective:

The objective is to make the students draw the projections ands sections of the various types of solids in different positions inclined to both the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders – axis inclined to both the planes.

SECTIONS OF SOLIDS: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

UNIT-IV

The knowledge of interpenetration of solids and development of surfaces is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection.

INTERPENETRATION OF RIGHT REGULAR SOLIDS: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

DEVELOPMENT OF SURFACES: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.

Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcomes:

CO1. To make the students to draw the attributes and its importance in the fields of design and manufacturing

CO2. To make the student familiar with the techniques used for drawing various geometric elements used in engineering practice.

CO3. Making them to understand orthographic projections of points, lines, planes and solids in various positions with respect to different reference planes.

CO4. Ability to use the concepts of isometric projections to analyze 3D objects by viewing their

2D projections and vice versa.

L	T	P	C
0	0	3	1.5

B.Tech I Year I Semester

English Communicative Skills Lab-I
(Common to all Branches)

UNIT I:
Pronunciation-Vowels, Consonants
Oral Activity: JAM

UNIT II:
Pronunciation: Consonants
Oral Activity: Past tense markers
UNIT III:
Pronunciation: Word Stress
Oral Activity: Hypothetical Situations

UNIT IV:
Pronunciation: Disyllabic words, polysyllabic words
Oral Activity: Self /Peer profile
UNIT V: Common Errors in Pronunciation
Neutralizing Accent

Prescribed text book: Phonetic Transcription
1. "**Infotech English**", Maruthi Publications.

References Books :

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.

B.Tech I Year I Semester

L	T	P	C
0	0	3	1.5

APPLIED PHYSICS LAB

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1. V-I Characteristics of a PN junction diode
2. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
3. Energy Band gap of a Semiconductor - PN junction diode
4. RC circuit – time constant
5. Newton's rings – Radius of Curvature of Plano - Convex Lens
6. V-I Characteristics of a Zener junction diode
7. Diffraction Grating - Normal Incidence
8. Dielectric Constant of different materials
9. Planck's constant using photocell
10. LCR- series resonance circuit
11. Thickness of a Spacer Using wedge Film and Parallel Interference Fringes
12. Resistivity of semiconductor by Four probe method
13. B-H curve
14. Dispersive power of diffraction grating
15. Hall Effect

L	T	P	C
0	0	3	1.5

B.Tech I Year I Semester

Problem Solving and Programming Using C Lab

Course Objectives:

- To impart knowledge on basic Linux commands, various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure, Unions and files for solving various problems.

List of Experiments:

1. Introduction to Algorithms and Flowcharts

1.1) Implement Algorithm Development for Exchange the values of Two numbers.

1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.

1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

2.1) Basic Linux Commands.

2.2) Exposure to Turbo C, Vi, Emacs, Code Blocks IDE, Dev C++.

2.3) Writing simple programs using printf(), scanf() .

3. Raptor

3.1) Installation and Introduction to Raptor.

3.2) Draw a flow chart to find the Sum of 2 numbers.

3.3) Draw a flow chart to find Simple interest.

4. Basic Math

4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.

4.2) Write a C Program to find largest of three numbers using ternary operator.

4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.

5.2) Write a C program to find the roots of a Quadratic Equation.

5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch…case.

6. Control Flow- II

6.1) Write a C Program to Find Whether the Given Number is Prime number or not.

6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.

6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

7.1) Write a C program to find the sum of individual digits of a positive integer.

7.2) Write a C program to check whether given number is palindrome or not.

7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression

8. Arrays

8.1) Write a C program to search an element in the given array (Linear Search).

8.2) Write a C program to perform matrix addition.

8.3) Write a C program to perform matrix multiplication.

9. Pointers

9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.

9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

10.1) Write a C Program to demonstrate parameter passing in Functions.

10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.

10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

11. Strings

11.1) Implementation of string manipulation operations with library function:

a) copy

b) concatenate

c) length

d) compare

11.2) Implementation of string manipulation operations without library function:

a) copy

b) concatenate

c) length

d) compare

11.3) Verify whether the given string is a palindrome or not.

12. Structures

12.1) Write a C Program to Store Information of a book Using Structure.

12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

13.1) Write a C program to open a file and to print the contents of the file on screen.

13.2) Write a C program to copy content of one file to another file.

13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Course Outcomes:

- Implement basic programs in C and design flowcharts in Raptor.
- Use Conditional and Iterative statements to solve real time scenarios in C.
- Implement the concept of Arrays and Modularity and Strings.
- Apply the Dynamic Memory Allocation functions using pointers.
- Develop programs using structures, and Files.

Reference Books:

1. Let Us C Yashwanth Kanetkar, 16th edition, BPB Publications.
2. Programming in C A-Practial Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
4. Problem solving using C , K Venugopal,3rd Edition,TMG Publication.

Web Links:

1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

B.Tech I Year I Semester

L	T	P	C
0	0	2	1

Electronic Workshop

LIST OF EXPERIMENTS:

1. Identification and specifications of R, L, C Components (Colour Codes), potentiometers and gang condensers.
2. Study of cathode ray oscilloscope (CRO).
3. Identification and utility of bread boards and single layer and multi layer PCBs.
4. Study and operation of voltmeters and ammeters and multimeters (Analog and Digital)
5. Study and operation of regulated power supplies.
6. Study and operation of function generators
7. Identification, Specifications and Testing of Active Devices: Diodes, BJTs, JFETs, LEDs, SCR and UJT
8. Identification and working of switches (SPDT, DPDT, and DIP), relays, microphones and loud speakers.
9. Measurement of voltage, current and frequency using cathode ray oscilloscope (CRO).
10. Calculation of resistance in series and parallel
11. Calculation of Voltage and Current in T and π network
12. Soldering practice – simple circuits using active and passive components.

B.Tech I Year I or I Semester

L	T	P	C
3	0	0	0

Professional Ethics & Human Values

(Common to All Branches)

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk

Unit I: Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Unit II: Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Unit III: Engineering as Social Experimentation

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons

UNIT IV: Engineers Responsibility for Safety and Risk:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

UINIT V: Global Issues

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics-Computers as the

instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous-Computers-Computer codes of Ethics –Weapons Development -Ethics and Research – Analyzing Ethical Problems in research.

Course outcomes:

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- Identify the multiple ethical interests at stake in a real-world situation or practice
- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Books:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
4. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M. Jayakumaran-LaxmiPublications.
6. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
7. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

B.Tech I Year I or I Semester

L	T	P	C
0	0	2	0

APPLIED PHYSICS VIRTUAL LAB

LIST OF EXPERIMENTS:

1. Brewster's Angle
2. Stopping Potential using The Photo Electric Current
3. Hall Effect
4. Numerical Aperture and Acceptance Angle - Optical Fiber
5. Acoustic Grating
6. Resistivity of Semiconductors by Four Probe Method
7. To Understand The Barkhausen Effect
8. Reduction Factor of The Given Tangent Galvanometer
9. B-H Curve
10. Refractive Index of a Given Liquid using Newton’s Rings Experiment

L	T	P	C
3	0	0	3

B.Tech I Year II Semester

Linear algebra and Numerical Methods

(Common to ALL branches)

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Unit I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

Rank of a matrix by echelon form and normal form- Gauss Jordan method to find inverse – Solving system of homogeneous and non-homogeneous equations linear equations — Eigen values and Eigen vectors and their properties.
Applications: Free vibration of a two-mass system.

Unit-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley-Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT III: Iterative methods: (8 hrs)

Introduction – Algebraic transcendental equations: Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations)

Solving system of linear equations: Gauss elimination- Diagonal dominance- Jacobi and Gauss-Seidel methods– Necessary and sufficient condition for convergence(only statement)- Power Method for finding Largest Eigenvalue –Eigenvector.

UNIT IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

UNIT V: Numerical integration and solution of ordinary differential equations

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.

Course Outcomes:

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

- develop the use of matrix algebra techniques that is needed by engineers for practical applications
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations

Text Books:

1. **M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
2. **B. S. Grewal,** Higher Engineering Mathematics, 43^{rd} Edition, Khanna Publishers.

Reference Books:

1. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **David Poole,** Linear Algebra- A modern introduction, 4^{th} Edition, Cengage.
3. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
4. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

L	T	P	C
3	0	0	3

B.Tech I Year - II Semester or II Year - I Semester

Vector Calculus, Transforms and PDE

(Common to ECE, EEE of I B.Tech - II Semester & Civil, ME, MET of II B.Tech - I Semester)

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Unit –I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

Unit –II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) and integro differential equations using Laplace transforms.

Unit –III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

Unit –IV: PDE of first order: **(8 hrs)**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: **(10 hrs)**

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Course Outcomes:

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

- interpret the physical meaning of different operators such as gradient, curl and divergence
- estimate the work done against a field, circulation and flux using vector calculus
- apply the Laplace transform for solving differential equations
- find or compute the Fourier series of periodic signals
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
- identify solution methods for partial differential equations that model physical processes

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Reference Books:

1. **B. V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **Dean. G. Duffy,** Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. **Peter O' Neil,** Advanced Engineering Mathematics, Cengage.

   Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press

L	T	P	C
3	0	0	3

B.Tech I Year I or II Semester

APPLIED CHEMISTRY

(For Circuital branches ECE, EEE, CSE & IT)

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- ***Importance*** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- ***Outline*** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- ***Express*** the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- ***Explain*** the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied.
- ***Recall*** the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I: POLYMER TECHNOLOGY

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

Electrochemical Cells: Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H_2-O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

Corrosion:-Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, special paints).

UNIT III: MATERIAL CHEMISTRY

Part I *: Non-elemental semiconducting materials:-* Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:- Introduction-sol-gel method- characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

UNIT IV: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction, Ab Initio studies, DFT; TD-DFT calculations using Guassian software

***Molecular switches*:** characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

UNIT V: SPECTROSCOPIC TECHNIQUES & NON CONVENTIONAL ENERGY SOURCES

Spectroscopic Techniques: Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Non Conventional Energy Sources: Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, organic photo-voltaics, hydropower, geothermal power, wind power, tidal and wave power, ocean thermal energy conversion.

Course Outcomes:

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

- ***Outline*** preparation, properties and applications of some plastic materials and synthetic rubber explain the mechanism of conduction in conducting polymers.
- ***Explain*** the theory of construction of battery, fuel cells and categorize the reasons for corrosion and study some methods of corrosion control.
- ***Understand*** the importance of materials like nanomaterials and fullerenes and their uses,

  liquid crystals and superconductors.
- ***Obtain*** the knowledge of computational chemistry and understand the importance molecular machines, principles of different analytical instruments.
- **Explain** the different applications of analytical instruments and study the design sources of energy by different natural sources.

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co. Latest edition
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition

Reference Books:

1. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest edition
2. Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co. Latest edition

I Year - II Semester

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3	0	0	3

BASIC ELECTRICAL ENGINEERING

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Preamble:

This course covers various topics related to principle of operation and performance of various electrical machines.

Course Educational Objectives:

- To understand the principle of operation, constructional details andoperational characteristics ofDCgenerators.
- To understand the principle of operation, characteristics of DC motor. Methodsof starting and speed control methods ofDCmotors.
- To learn the constructional details, principle of operation and performanceof transformers.
- To study the principle of operation, construction and details ofsynchronousmachines.
- To learn the principle of operation, constructional details, performance, torque – slip characteristics and starting methods of 3-phaseinductionmotors.

Unit I

DC Machines

Principle of operation of DC generator – emf equation – types of DC machines – torque equation of DC motor – applications – three point starter - losses and efficiency - swinburne's test - speed control methods – OCC of DC generator-Brake test on DC Shunt motor-numerical problems

Unit II

Transformers

Principle of operation of single phase transformer constructional features – EMF equation – Losses and efficiency of transformer- regulation of transformer – OC & SC tests predetermination of efficiency and regulations – Sumpner's test-NumericalProblems.

Unit III

Synchronous Generators

Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method-EMF equation of three phase alternator

Synchronous Motors

Construction of three phase synchronous motor - operating principle –equivalent circuit of synchronous motor.

Unit IV

Induction Machine: Principle of operation and construction of three-phase induction motors – slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation – starting methods-Brake test on 3-Phase Induction

Motor.

Unit V

Special Machines: Principle of operation and construction - single phase induction motor - shaded pole motors – capacitor motors and AC servomotor.

Course Outcomes:

- Able to explain the operation of DC generator and analyze the characteristics of DC generator.
- Able to explain the principle of operation of DC motor and analyze theircharacteristics. Acquire the skills to analyze the starting and speed control methods ofDCmotors.
- Ability to analyze the performance and speed – torque characteristics of a3-phase induction motor and understand starting methods of 3-phaseinductionmotor.
- Able to explain the operation ofSynchronousMachines
- Capability to understand the operation of variousspecialmachines.

TEXT BOOKS*:*

1. Principles of Electrical Machines by V.K. Mehta &Rohit Mehta,S.Chandpublications
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria&Sons

REFERENCE BOOKS*:*

1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
3. Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2nd edition

I Year - II Semester

L	T	P	C
3	1	0	3

NETWORK ANALYSIS

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality withexamples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – II

Transients : First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

UNIT – III

Steady State Analysis of A.C Circuits : Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

Coupled Circuits : Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

UNIT – IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case-resistance present in both branches, anti resonance at all frequencies. (Text

Books:2,3, Reference Books: 3)
Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition,Max Power Transfer, Tellegens-problem solving using dependent sources also. (Text Books: 1,2,3, ReferenceBooks:2)

UNIT – V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rdEdition,2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju,CengageLearning
3. Electric Circuit Analysis by Hayt andKimmarle,TMH

REFERENCES:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asiapublishinghouse.
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers. 3.Network Analysis and Filter Design by Chadha,UmeshPublications.

COURSE OBJECTIVES:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states inRLCcircuits.
- To know the basic Laplace transforms techniques inperiods'waveforms.
- To understand the two portnetworkparameters.
- To understand the properties of LC networksandfilters.

COURSE OUTCOME:

- gain the knowledge on basic networkelements.
- will analyze the RLC circuits behaviorindetailed.
- analyze the performance of periodicwaveforms.
- gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h&g).
- analyze the filter design concepts in realworldapplications.

B.Tech I Year II Semester

L	T	P	C
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Advanced Communication Skills Lab -english
(Common to all Branches)

UNIT I:

Pronunciation: Contrastive stress (Homograph)

Oral Activity: Telephone Etiquette

UNIT II:

Pronunciation: Word stress – Weak and Strong forms

Oral Activity :Role plays

UNIT III:

Pronunciation: Phonetics Transcription Oral Activity :Data Interpretation, Oral presentation skills

Oral Activity: Oral presentation Skills

UNIT IV:

Pronunciation: Connected speech (Pausing ,Tempo, Tone, Fluency ,etc..)

Oral Activity: Public Speaking ,Poster Presentation

UNIT V:

Pronunciation: Stress in compound words ,Rhythm and Intonation

Oral Activity: Group discussions: Do's and Don'ts –Types ,Modalities

Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.

References:

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
7. Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
8. Technical Communication- Gajendrea Singh Chauhan, Smita Kashiramka, Cengage Publications.

L	T	P	C
0	0	3	1.5

B.Tech I Year I or II Semester

APPLIED CHEMISTRY LAB
(For Circuital branches ECE, EEE, CSE & IT)

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of copper (II) using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of iron (III) by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ present in an egg shell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

A Textbook of Quantitative Analysis, Arthur J. Vogel

I Year - II Semester	L	T	P	C
	0	0	3	1.5

BASIC ELECTRICAL ENGINEERING LAB

Learning Objectives:

- To plot the magnetizing characteristics ofDC shunt generator and understand the mechanism ofself-excitation.
- To control the speed ofDCmotors.
- To determine and predetermine the performance ofDCmachines.
- To predetermine the efficiency and regulation of transformers and assesstheirperformance.
- To analyse performance of three phaseinductionmotor.
- To understand the significance of regulation of an alternators using synchronousimpedance method.

Any ten of the following experiments are to be conducted

1. Magnetization characteristics of D.C. Shunt generator.
2. Speed control of D.C.shuntmotor.
3. Brake test on DCshuntmotor.
4. Swinburne's test onDCmachine
5. Load test on DCshuntgenerator
6. Load test on DCseriesgenerator.
7. Separation of losses iun DCShuntmotor
8. OC & SC tests onsingle-phasetransformer
9. Sumpner's test on singlephasetransformer
10. Brake test on 3-phase Inductionmotor.
11. Regulation of alternator by synchronousimpedancemethod.

Learning Outcomes:

The student should be able to:

- Determine and predetermine the performance of DC machinesandtransformers.
- Control the DC shunt machines.
- Compute the performance of1-phasetransformer.
- Perform tests on 3-phase induction motor and alternator to determinetheirperformance characteristics.

B.Tech I Year I or II Semester	L	T	P	C
	0	0	1	0.5

Engineering Exploration Project-Design Thinking

L	T	P	C
3	0	0	0

B.Tech I Year I or II Semester

Constitution of India

(Common to All Branches)

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court

controller and auditor general of India and election commission of India.

- To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and

constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive

Principles of State Policy.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central

Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT-IV

Local Administration - District's Administration Head - Role and Importance, Municipalities – Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions

PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational

Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials – Importance of grass root democracy

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC

and women

Course Outcomes:
At the end of the semester/course, the student will be able to have a clear knowledge on the following:

 Understand historical background of the constitution making and its importance for building a
democratic India.

 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

 Understand the value of the fundamental rights and duties for becoming good citizen of India.

 Analyze the decentralization of power between central, state and local self-government.

 Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission

References Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New
Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPolitics Hans
7. J. Raj IndianGovernment and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice –
Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right),
Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

L	T	P	C
2	0	0	0

B.Tech I Year I or II Semester

Physical Fitness Activities/Yoga

II Year - I Semester

L	T	P	C
3	0	0	3

ELECTRONIC DEVICES AND CIRCUITS

Objectives:

The main objectives of this course are:

i. The basic concepts of semiconductor physics are to be reviewed.
ii. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
iii. The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
iv. The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
v. The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.
vi. Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.

Syllabus:

UNIT-I:

Semi Conductor Physics:

Insulators, Semi conductors, and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

UNIT- II:

Junction Diode Characteristics:

Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Photo diode, Tunnel Diode, SCR, UJT. Construction, operation and characteristics of all the diodes are required to be considered.

UNIT- III:

Rectifiers:

Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms.

Filters:

Introduction to Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors.

UNIT- IV:

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

Small Signal Low Frequency Transistor Amplifier Models: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

UNIT- V:

Transistor Biasing and Thermal Stabilization:

Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET. Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers and FET Biasing- methods and stabilization.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

References:

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
2. Electronic Devices and Circuits – Bell, Oxford

Outcomes:

At the end of this course the student can able to:

i. Understand the basic concepts of semiconductor physics.
ii. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
iii. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
iv. Understand the construction, principle of operation of transistors, BJT and their V-I characteristics in different configurations.
v. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
vi. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

	L	T	P	C
II Year - I Semester	**3**	**0**	**0**	**3**

DIGITAL ELECTRONICS

Objectives:

i. To solve a typical number base conversions and analyze new error coding techniques
ii. To optimize logic gates for digital circuits using various techniques
iii. To understand concepts of Adders and Sub tractors and analyze different types of decoders, encoders, code converters, multiplexers and comparators.
iv. To understand the basic concept flip flops and analyze basic counters and shift registers
v. To understand the basic concepts of PLDs

UNIT – I:

Review Of Number Systems:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, problem solving. 4 bit codes, BCD, Excess-3, 2421, 84-2-1 $9^{'s}$ compliment code etc.

Boolean functions and logic operations:

Logic operations and error detection & correction codes; Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code) NAND-NAND and NOR-NOR realizations.

UNIT – II:

Minimization Techniques:

Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT-III:

Combinational Logic Circuits Design-I

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit,

Combinational Logic Circuits Design-II

Introduction to Encoder and Decoder , Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

UNIT-IV:

Introduction to Flip Flops and Conversions :

Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and excitation tables (nand RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Conversion from one flip-flop to flip-flop.

Sequential Circuits I: Introduction to counters and registers, Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT – V:

Sequential Circuits II

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Meelay to Moore conversion and vice-versa.

Introduction Of PLD's:

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching Theory and Logic Design by A. Anand Kumar
3. Digital Design by Mano PHI.

REFERENCE BOOKS:

1. Modern Digital Electronics by RP Jain, TMH
2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers
3. Micro electronics by Milliman MH edition.

Outcomes:

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

i. Classify different number systems and apply to generate various codes.
ii. Use the concept of Boolean algebra in minimization of switching functions
iii. Design different types of Adders and Subtractors
iv. Design different types of decoders, encoders, code converters, multiplexers and comparators
v. Apply knowledge of flip-flops in designing of Registers and Counters

II Year - I Semester

L	T	P	C
3	1	0	3

SIGNALS & SYSTEMS

OBJECTIVES:

The main objectives of this course are given below:

i. To introduce the terminology of signals and systems.
ii. To introduce Fourier tools through the analogy between vectors and signals.
iii. To introduce the concept of sampling and reconstruction of signals.
iv. To analyze the linear systems in time and frequency domains.
v. To study z-transform as mathematical tool to analyze discrete-time signals and systems.

UNIT- I:

Introduction: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. 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.

Fourier series:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum.

UNIT –II:

Fourier Transform :Deriving Fourier transform from Fourier series,Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

Sampling: 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-III:

Analysis Of Linear Systems: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

Correlation and Convolution:

Introduction to Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation

between auto correlation 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.

UNIT –IV:

Laplace Transforms : Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT –V:

Z–Transforms : Fundamental difference between continuous-time and discrete-time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
4. Signals and Systems – T K Rawat , Oxford University press, 2011

OUTCOMES:

At the end of this course the student will able to:

i. Characterize the signals and systems and principles of vector spaces, Concept of orthgonality.
ii. Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
iii. Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
iv. Understand the relationships among the various representations of LTI systems
v. Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships. And Apply z-transform to analyze discrete-time signals and systems.

II Year - I Semester

L	T	P	C
3	1	0	3

COMPLEX VARIABLES AND STATISTICAL METHODS

Course Objectives:

i. To familiarize the complex variables.

ii. To familiarize the students with the foundations of probability and statistical methods.

iii. To equip the students to solve application problems in their disciplines.

iv. To understand the basic concept of sampling theory

v. To understand the concept of hypothesis testing

UNIT-I: Functions of a complex variable and Complex integration: (10 hrs)

Introduction – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method.

Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs).

UNIT-II: Series expansions and Residue Theorem: (10 hrs)

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.

Types of Singularities: Isolated – pole of order m – Essential – Residues – Residue theorem (without proof) – Evaluation of real integral of the type $\int_{-\infty}^{\infty} f(x)dx$

UNIT – III: Probability and Distributions: (10 hrs)

Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory: (8 hrs)

Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT – V: Tests of Hypothesis: (10 hrs)

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008.

Reference Books:

1. **S. C. Gupta and V. K. Kapoor**, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
2. **Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
4. **Sheldon, M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011

Course Outcomes: At the end of the course students will be able to

i. apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic
ii. find the differentiation and integration of complex functions used in engineering problems
iii. make use of the Cauchy residue theorem to evaluate certain integrals
iv. apply discrete and continuous probability distributions
v. design the components of a classical hypothesis test and infer the statistical inferential methods based on small and large sampling tests

II Year - I Semester

L	T	P	C
3	1	0	3

RANDOM VARIABLES & STOCHASTIC PROCESSES

OBJECTIVES:

i. To give students an introduction to elementary probability theory, in preparation for courses on statistical analysis, random variables and stochastic processes.
ii. To mathematically model the random phenomena with the help of probability theory concepts.
iii. To introduce the important concepts of random variables and stochastic processes.
iv. To analyze the LTI systems with stationary random process as input.
v. To introduce the types of noise and modelling noise sources.

UNIT I

THE RANDOM VARIABLE : Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II

OPERATION ON ONE RANDOM VARIABLE – EXPECTATIONS : Introduction, 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 Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable.

UNIT III

MULTIPLE RANDOM VARIABLES :

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT IV

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, N^{th}-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT V:

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS : 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, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4^{th} Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, PHI, 4^{th} Edition, 2002.

REFERENCE BOOKS:

1. Probability Theory and Stochastic Processes – B. Prabhakara Rao, BS Publications
2. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3^{rd} Edition.
3. Schaum's Outline of Probability, Random Variables, and Random Processes.
4. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook, 1968.
5. Random Process – Ludeman , John Wiley
6. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill, 2015.

OUTCOMES:

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

i. Mathematically model the random phenomena and solve simple probabilistic problems.
ii. Identify different types of random variables and compute statistical averages of these random variables.
iii. Characterize the random processes in the time and frequency domains.
iv. Analyze the LTI systems with random inputs.
v. Apply these techniques to analyze the systems in the presence of different types of noise.

L	T	P	C
3	0	0	3

B.Tech II Year I Semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to all Branches)

Course Objectives:

- The Learning objectives of this paper is to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting, Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation. Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern

methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product and the knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- One is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis and to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS:

1. Prof.J.V.Prabhakara Rao & Prof.P.Venkata Rao Maruthi Publications
2. S.A.Siddiqui & A.S.Siddiqui New Age International Publishers

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. Maheswari S.N, An Introduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd

II Year - I Semester

L	T	P	C
0	0	3	1.5

ELECTRONIC DEVICES AND CIRCUITS LAB

Course Objectives

i. To measure the voltage, current and frequency using CRO.
ii. To observe experimentally the V-I characteristics of PN junction diode & zener diode.
iii. To observe experimentally the V-I characteristics of BJT in CB, CE and CC configuration.
iv. To observe experimentally the characteristics of FET, UJT, SCR
v. To observe experimentally the characteristics of CE,CC and CS amplifier

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics (Forward bias& Reverse bias)

   Part A: Germanium Diode Part B: Silicon Diode
2. Zener Diode Characteristics

   Part A: V-I Characteristics Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter)

   Part A: Half-wave Rectifier Part B: Full-wave Rectifier
4. BJT Characteristics(CE Configuration)

   Part A: Input Characteristics Part B: Output Characteristics
5. FET Characteristics(CS Configuration)

   Part A: Drain Characteristics Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Course Outcomes

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

i. Determine the voltage, current and frequency using CRO.
ii. Draw the characteristics of PN Diode and Zener Diode.
iii. Explain the characteristics of transistor in CB, CE and CC configurations.
iv. Compute the V-I characteristics of FET,UJT and SCR
v. Compute the characteristics of CE, CC and CS amplifier

	L	T	P	C
II Year - I Semester	**0**	**0**	**3**	**1.5**

DIGITAL ELECTRONICS LAB

Course Objectives:

i. To Verify the truth tables of logic gates
ii. To Design and verify the operation of combinational circuits.
iii. To Design and verify the operation of sequential circuits
iv. To Verify the operation of Johnson/ring counter and different types shift register
v. To Verify the operation of RAM and ALU

The students are required to design and draw the internal structure of the following Digital Integrated Circuits and to it is required to verify the logic with necessary hardware.

List of Experiments:

1. Realization of Logic Gates
2. 3 to 8 Decoder- 74138
3. 8*1 Multiplexer-74151 and 2*1 De-multiplexer-74155
4. 4-Bit Comparator-7485.
5. D Flip-Flop- 7474
6. Decade Counter- 7490
7. 4 Bit Counter-7493
8. Shift Register-7495
9. Universal shift register-74194/195
10. Ram (16*4)-74189 (read and write operations)
11. ALU

Equipments Required:

1. Power supply
2. Integrated Circuits
3. Trainer Kits

Course Outcomes:

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

i. Distinguish logic gates for design of digital circuits
ii. Design different types of Combinational logic circuits
iii. Analyze the operation of flip-flops
iv. Apply knowledge of flip-flops in designing of Registers and Counters
v. Analyze the operation of RAM and ALU

II Year - I Semester

L	T	P	C
3	0	0	0

INTELLECTUAL PROPERTY RIGHTS& PATENTS

Course Objectives:

- The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
- To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
- Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.
- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.

UNIT-I:

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies
Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

UNIT II:

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of
Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

UNIT III:

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation –
International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.
Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement –

Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law

UNIT IV:
Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement –Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

UNIT V:
Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

REFERENCE BOOKS:
1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections
4. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights",Excel Books. New Delhi.
7. M. Ashok Kumar and Mohd.Iqbal Ali: "Intellectual Property Right"

Course Outcomes:
At the end of the course the student will be able to:

- The students once they complete their academic projects, shall get an adequate knowledge on patents
- The students once they complete their academic projects, shall get an adequate knowledge on copyright for their innovative research works
- During their research career, information in patent documents provides useful insight on novelty of their idea from state-of-the art search. This provides further way for developing their idea or innovations.
- Pave the way for the students to catch up Intellectual Property (IP) as an career option: . Government Jobs – Patent Examiner
- Pave the way for the students to catch up Intellectual Property (IP) as an career option: Private Jobs and Patent agent and Trademark agent and Entrepreneur.

II Year - II Semester

L	T	P	C
3	1	0	3

ELECTRONIC CIRCUIT ANALYSIS

Objectives:

The main objectives of this course are:

i. Small signal high frequency BJT transistor amplifier Hybrid-π equivalent circuit and the expressions for conductances and capacitances are derived.
ii. Cascading of single stage amplifiers is discussed. Expressions for overall voltage gain are derived.
iii. The concept of feedback is introduced. Effect of negative feedback on amplifier characteristics is explained and necessary equations are derived and Basic principle of oscillator circuits is explained and different oscillator circuits are given with their analysis.
iv. Power amplifiers Class A, Class B, Class C, Class AB and other types of amplifiers are analyzed.
v. Different types of tuned amplifier circuits are analyzed.

UNIT-I

Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductances, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II

Multistage Amplifiers : Classification of amplifiers, methods of coupling**, c**ascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT-III:

Feedback Amplifiers : Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET and their analysis, Frequency and amplitude stability of oscillators.

UNIT-IV

Power Amplifiers: Classification of amplifiers, Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

UNIT-V

Tuned Amplifiers : Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on band width, effect of cascading double tuned amplifiers on band width, staggered tuned amplifiers, stability of tuned amplifiers, wideband amplifiers.

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata Mc Graw-Hill, 1972.
2. Electronic Devices and Circuits- Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

References:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
3. Electronic Circuit Analysis-B.V.Rao,K.R.Rajeswari, P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
4. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.

Outcomes:

At the end of this course the student can able to:

i. Design and analysis of small signal high frequency transistor amplifier using BJT and FET.

ii. Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT

iii. Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.

iv. Know the classification of the power amplifiers and their analysis with performance comparison.

v. Know the classification of the tuned amplifiers and their analysis with performance comparison.

II Year - II Semester

L	T	P	C
3	1	0	3

CONTROL SYSTEMS

Course objectives

i. To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
ii. To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
iii. To analyze the system in terms of absolute stability and relative stability by different approaches
iv. To design different control systems for different applications as per given specifications
v. To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability

UNIT-I

Introduction

System Control System, Open Loop Control System, Closed loop Control System, Different Examples

Mathematical models of Physical Systems

Differential equations of physical systems, Transfer functions, Block diagram Algebra, Signal flow graphs with illustrative examples

Effects of Feedback

Feedback Characteristics and its advantages, Linearizing effect of feedback

UNIT-II

Controller Components

DC Servomotor (Armature Controlled and Field Controlled) with necessary derivation for transfer function, AC Servomotor and its transfer function, AC Tachometer, Potentiometer, Synchros, AC Position Control Systems

Time Response Analysis

Standard test Signals, Time response of first and second order systems, steady state errors and error constants, Effect of adding a zero to a system, Design specifications of second order systems, Performance indices

UNIT-III

Concepts of Stability and Algebraic Criteria

The concept of Stability, Necessary Conditions for Stability, Routh-Hurwitz Srability Criterion, Relative stability analysis,

The Root Locus Technique

Introduction, The Root Locus concepts, Construction of Root Loci

UNIT-IV

Frequency response analysis

Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion

UNIT-V:

Introduction to Design

The design problem, Preliminary consideration of classical design, Realization of basic Compensators, Cascade compensation in time domain and frequency domain, Tuning of PID Controllers

State Variable Analysis and Design

Introduction, Concepts of State, State Variables and State models, State models for linear continuous-time systems, State variables and linear discrete-time systems, Solution of state equations and Concepts of Controllability and Observability.

Text Book

I.J.Nagarath and M.Gopal, " **Control System Engineering,"** New Age International Publishers, Fifth Edition

Reference Books

1. Katsuhiko Ogata, "Modern Control Engineering," Pearson, Fifth Edition
2. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, " Control Systems Engineering," Pearson, First Impression
3. Benjamin C. Kuo, Frarid Golnaraghi, " Automatic Control Systems," Wiley Student Edition, Eigth Edition
4. PadmaRaju and Reddy , " Instrumentation and Control Systems ", McGrawHill Education ,2016

Course Outcomes

i. This course introduces the concepts of feedback and its advantages to various control systems
ii. The performance metrics to design the control system in time-domain and frequency domain are introduced.
iii. Understand the Concept of stability and different analysis
iv. Control systems for various applications can be designed using time-domain and frequency domain analysis.
v. In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.

II Year - II Semester

L	T	P	C
3	1	0	3

ELECTRO MAGNETIC FIELD THEORY AND TRANSMISSION LINES

OBJECTIVES:

The main objectives of this course are to understand:

i. Fundamentals of steady electric and magnetic fields using various laws
ii. The concept of static and time varying Maxwell equations and power flow using pointing theorem
iii. Wave characteristics in different media for normal and oblique incidence
iv. Various concepts of transmission lines and impedance measurements
v. Concept of smith chart and stub matching

UNIT I:

Review of Co-ordinate Systems, **Electrostatics:**, Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT II:

Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems**. [1,5]**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces. Illustrative Problems. **[1,2]**

UNIT III:

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types. Illustrative Problems. **[1,2,3]**

EM Wave Characteristics – II: 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 – Applications, Power Loss in a Plane Conductor. Illustrative Problems. **[2,3,4]**

UNIT IV:

Transmission Lines - I : Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Loading - Types of Loading. Illustrative Problems. **[1,7]**

UNIT V:

Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations λ/4, λ /2, λ/8 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Stub Matching-single & double, Illustrative Problems.

TEXT BOOKS:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Electromagnetic Fields and Wave Theory –GSN Raju, Pearson Education 2006
2. Engineering Electromagnetics:Nathan Ida, Springer(India)Pvt.Ltd., New Delhi, 2nd ed., 2005.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
4. Electromagnetic Field Theory and Transmission Lines: G SasiBhushana Rao,Wiley India 2013
5. Transmission Lines and Networks–Umesh Sinha,Satya Prakashan (Tech. India Publications), New Delhi, 2001.
6. Electromagnetic waves and transmission lines – R S Rao, PHI, EEE edition

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OUTCOMES:

At the end of this course the student can able to:

i. Determine E and H using various laws and applications of electric & magnetic fields
ii. Apply the Maxwell equations to analyze the time varying behavior of EM waves
iii. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
iv. Calculate Brewster angle, critical angle and total internal reflection
v. Derive the expressions for input impedance of transmission lines and Calculate reflection coefficient, VSWR etc. using smith chart

II Year - II Semester

L	T	P	C
3	1	0	3

ANALOG COMMUNICATIONS

Course Objectives:

Students undergoing this course, are expected to

i. Familiarize with the fundamentals of analog communication systems
ii. Familiarize with various techniques for analog modulation and demodulation of signals
iii. Distinguish the figure of merits of various analog modulation methods
iv. Develop the ability to classify and understand various fuctional blocks of radiao transmitters and receivers
v. Familiarize with basic techniques for generating and demodulating various pulse modulated signals

UNIT I

AMPLITUDE MODULATION : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB & SSB MODULATION : Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III

ANGLE MODULATION : Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM,.

Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM

UNIT IV

NOISE : Review of noise and noise sources, noise figure**,** Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

UNIT V

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of superheterodyne principle and additional circuits.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.,.

REFERENCES:

1. Communication Systems – B.P. Lathi, BS Publication, 2006.
2. Electronics & Communication System – Georg Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
4. Fundamentals of Communication Systems - JohnG. Proakis, Masond, Salehi PEA, 2006.
5. Electronic Communication systems – Tomasi, Pearson.

Course Outcomes:

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

i. Explain the basic elements of communication system, need for modulation and elaborately about amplitude modulation.
ii. Describe the time and frequency domain representation, generation and demodulation of DSBSC, SSB and VSB modulation schemes.
iii. Discuss the concepts of angle modulation.
iv. Explain various issues in radio transmitters and receivers
v. Describe pulse modulation schemes and estimate the noise in analog modulation schemes

II Year - II Semester

L	T	P	C
3	0	0	3

COMPUTER ARCHITECTURE AND ORGANIZATION

Objectives

The student will

i. Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
ii. Understand the principles and the implementation of computer arithmetic and ALU.
iii. Understand the memory system, I/O organization
iv. Understand the operation of modern CPUs including interfacing, pipelining, memory systems and busses.
v. Understand the principles of operation of multiprocessor systems.

UNIT-I

BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data types, Complements, Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.

COMPUTER ARITHMETIC: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT-II

REGISTER TRANSFER LANGUAGE AND MICRO-OPERATIONS: Register Transfer language. Register Transfer, Bus and memory transfer, 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 Onput
and Interrupt.

UNIT-III

CENTRAL PROCESSING UNIT - Stack organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer

THE MEMORY SYSTEM: Memory Hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware

UNIT-IV

INPUT-OUTPUT ORGANIZATION : Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Serial communication;

PIPELINE AND VECTOR PROCESSING: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors. **Multi processors:** Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration. Interprocessor Communication and Synchronization, Cache Coherence.

UNIT-V

MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, Design of control unit-Hard wired control. Micro programmed control

TEXT BOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafwatZaky, V Edition, McGraw Hill, 2002.

REFERENCES:

1. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson, 2006.
2. Computer Architecture and Organization – John P. Hayes, Mc Graw Hill International editions, 1998.

Objectives:

i. Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
ii. Understand the principles and the implementation of computer arithmetic and ALU.
iii. Understand the memory system, I/O organization
iv. Understand the operation of modern CPUs including interfacing, pipelining, memory systems and busses.
v. Understand the principles of operation of multiprocessor systems and Demonstrate the relationship between the software and the hardware and focuses on the foundational concepts that are the basis for current computer design.

L	T	P	C
3	0	0	3

B. Tech II or III Year II Semester

MANAGEMENT AND ORGANISATIONAL BEHAVIOUR
(Common to Civil, EEE, ECE, CSE, IT)

Course Objectives:

- To familiarize with the process of management and to provide basic insight into select contemporary management practices
- To provide conceptual knowledge on functional management Human resource management, strategic management and Organizational Behavior.

Unit I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

Unit II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

Unit III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking, Balanced Score Card and other Contemporary Business Strategies.

Unit IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

Unit V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Course Outcomes:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational behavior.
- Will familiarize with the concepts of functional management and strategic management.

Reference Books:

1. Subba Rao P., *Organizational Behaviour,* Himalaya Publishing House. Mumbai.
2. Fred Luthans *Organizational Behaviour,* TMH, New Delhi.
3. Robins, Stephen P., *Fundamentals of Management,* Pearson, India.
4. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
5. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2007
6. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2007.

II Year - II Semester

L	T	P	C
0	0	3	1.5

ELECTRONIC CIRCUIT ANALYSIS LAB

Course Objectives:

i. To design RC phase shift oscillator using transistors for different frequencies
ii. To design Wien Bridge oscillator using transistors for different frequencies
iii. To obtain frequency response of two stage RC coupled amplifier
iv. To design single tuned amplifier
v. To design series and shunt voltage regulator

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool**.** Further they are required to verify the result using necessary hardware equipment.

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required:

Software:

i. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
ii. Computer Systems with required specifications

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats

6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Course Outcomes:

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

i. Construct the RC phase shift oscillator using transistors for different frequencies
ii. Design Wien Bridge oscillator using transistors for different frequencies
iii. Estimate frequency response of two stage RC coupled amplifier
iv. Calculate the resonant frequency of single tuned amplifier
v. Draw the characteristics of series and shunt voltage regulators

II Year - II Semester

L	T	P	C
0	0	3	1.5

ANALOG COMMUNICATIONS LAB

Course Objectives:

i. Various analog modulation and demodulation schemes
ii. Verify sampling theorem
iii. Analyze various modulated schemes by using spectrum analyzer
iv. Various associated circuits of analog modulation schemes
v. Demonstrate the action of PLL

List of Experiments (Twelve experiments to be done- **The students have to calculate the relevant parameters**) - (a. Hardware, b. MATLAB Simulink, c. MATLAB Communication tool box)

A. Amplitude Modulation - Mod. & Demod.
B. AM - DSB SC - Mod. & Demod.
C. Spectrum Analysis of Modulated signal using Spectrum Analyser
D. Diode Detector
E. Pre-emphasis & De-emphasis
F. Frequency Modulation - Mod. & Demod.
G. AGC Circuits
H. Sampling Theorem
I. Pulse Amplitude Modulation - Mod. & Demod.
J. PWM , PPM - Mod. & Demod.
K. PLL
L. Radio receiver characteristics

Equipments & Software required: Software :

i.) Computer Systems with latest specifications
ii) Connected in Lan (Optional)
iii) Operating system (Windows XP)
iv) Simulations software (Simulink & MATLAB)

Equipment:

1.	RPS	-	0 – 30 V
2.	CRO	-	0 – 20 M Hz.
3.	Function Generators	-	0 – 1 M Hz
4.	Components		
5.	Multimeters		
6.	Spectrum Analyser		

Course Outcomes:

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

i. Integrate and test AM and FM modulators and demodulators
ii. Illustrate sampling theorem in different conditions
iii. Analyze AM and FM signals using Spectrum analyzer
iv. Test associated circuits such as AGC, pre-emphasis and de-emphasis
v. Integrate and test various pulse modulation and demodulation schemes and Estimate lock range and capture range of PLL

II Year - II Semester

L	T	P	C
3	0	0	0

ENVIRONMENTAL SCIENCE

Course Learning Objectives:

The objectives of the course is to impart

i. Overall understanding of the natural resources
ii. Basic understanding of the ecosystem and its diversity
iii. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
iv. An understanding of the environmental impact of developmental activities
v. Awareness on the social issues, environmental legislation and global treaties

UNIT – I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Literate, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social- Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – IV Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – V Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry/Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K.V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies , R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. "Perspectives in Environment Studies" Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

Course Outcomes:

The student should have knowledge on

i. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources and The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
ii. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity and Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
iii. Social issues both rural and urban environment and the possible means to combat the challenges
iv. The environmental legislations of India and the first global initiatives towards sustainable development. And About environmental assessment and the stages involved in EIA and the environmental audit.
v. Self Sustaining Green Campus with Environment Friendly aspect of – Energy, Water and Wastewater reuse Plantation, Rain water Harvesting, Parking Curriculum.

III Year I semester

L	T	P	C
3	0	0	3

LINEAR AND DIGTAL IC APPLICATIONS

COURSE OBJECTIVES:

i. Students will be able to describe the characteristics of Op-Amp
ii. Students will design various filters and waveform generators
iii. Students will Illustrate various A/D and D/A converters
iv. Students will Study and understand VHDL abstraction levels and elements
v. Students will Acquire skills required to write VHDL program for logic circuits

UNIT I: OP-AMP CHARACTERISTICS AND APPLICATIONS:

Characteristics of OP-Amps, Op-Amp Block Diagram, Ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers, Multivibrators, Triangular and Square wave generators, Log and Anti Log Amplifiers, Precision rectifiers.

UNIT II: ACTIVE FILTERS, IC-555 & IC-565 Applications:

Introduction, Butter worth filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. Waveform Generators: Triangular, Sawtooth, square wave, IC555 Timer- Functional Diagram, Monostable and Astable operations, Applications, IC 565 PLL-Block schematic, Description of individual blocks, Applications.

UNIT III: D to A & A to D CONVERTERS:

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifiations AD 574 (12-bit ADC)

UNIT IV: INTRODUCTION TO VHDL:

Design Flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers, Packages, Libraries and bindings, subprograms. VHDL programming using structural, and data flow modelling.

UNIT V: BEHAVIOURAL MODELLING:

Process statement, variable assignment statement, signal assignment statement, wait statement, if statement, case statement, null statement, loop statement, exit statement, next statement, assertion statement, more on signal assignment statement, VHDL programming using behavioral modelling for combinational and sequential logic design

TEXT BOOKS:

i. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
ii. VHDL Primer- J Bhaskar, Pearson Education/PHI, 3rd Edition.

REFERENCES:

i. Linear Integrated Circuits - D. Roy Chowdhury, New Age International (P) Ltd, 2nd Edition, 2003.
ii. Circuit Design with VHDL- Volnei A. Pedroni, NIT Press Cambridge.

COURSE OUTCOMES:

i. Design circuits using operational amplifiers for various applications.
ii. Analyze and design waveform generators and active filters using Op-amp.
iii. Design circuits for various A/D and D/A converters
iv. Understand the VHDL program structure
v. Design and implement behavioral modelling of sequential and combinational Circuits.

	L	T	P	C
III Year I semester	**3**	**0**	**0**	**3**

MICROPROCESSORS AND MICROCONTROLLERS

COURSE OBJECTIVES:

i. To understand learn concepts of microprocessor, different addressing modes and programming of 8086.
ii. Understand interfacing of 8086, with memory and other peripherals.
iii. To learn concepts of PPI, DMA and programmable interrupt controller.
iv. Study the features of advanced processors, Pentium processors.
v. Study the features of 8051 Microcontroller, its instruction set and also other controllers like PIC controllers.

UNIT-I:

8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration.

8086 PROGRAMMING: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-II:

8086 INTERFACING : Semiconductor memories interfacing (RAM,ROM), 8254 software programmable timer/counter, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display, LCD), Intel 8279 programmable keyboard/display controller, stepper motor, A/D and D/A converters.

UNIT-III:

80386 and 80486 MICROPROCESSORS: Introduction, programming concepts, special purpose registers, memory organization, moving to protected mode, virtual mode, memory paging mechanism, architectural differences between 80386 and 80486 microprocessors. Introduction to Pentium and ARM Processors.

UNIT-IV:

Intel 8051 MICROCONTROLLER: Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.

Assembly language programming: Instructions, addressing modes, simple programs. Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

UNIT-V:

PIC MICROCONTROLLER: Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC 16F877.

TEXT BOOKS:

i. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGrawHill Education Private Limited, 3rd Edition.
ii. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, DhananjayV.Gadre,Cengage Learninbg , India Edition.

REFERENCES:

i. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey,Pearson, Eighth Edition-2012.
ii. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.

COURSE OUTCOMES:

On successful completion of the course module students will be able to

i. Develop the assembly language programs for different addressing modes.
ii. Perform 8086 interfacing with different peripherals and implement programs.
iii. Describe the key features serial and parallel communication.
iv. Design Microcontroller for simple Applications.
v. Distinguish between architectures of various processors and controllers.

III Year I semester

L	T	P	C
3	1	0	3

DIGITAL COMMUNICATION

Course Objectives:

i. Understand different pulse digital modulation techniques and their comparison.
ii. Familiarize various digital modulation techniques.
iii. Learn the calculation of their error probabilities of different digital modulation techniques.
iv. Understand the concept of entropy and different source coding techniques.
v. To understand the concept of different source and channel coding techniques.

UNIT I: PULSE DIGITAL MODULATION:

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II: DIGITAL MODULATION TECHNIQUES:

Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III: DATA TRANSMISSION:

Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK,QPSK.

UNIT IV:

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, state, tree and trellis diagram decoding using viterbi algorithm.

UNIT V:

LINEAR BLOCK CODES: Linear clock codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC , Hamming code and their applications.

CYCLIC CODES AND BCH CODES: Basic properties of cyclic codes, generator and parity check matrix of cyclic codes. Encoding and decoding circuits, syndrome computation and error detection, cyclic hamming codes encoding and decoding of BCH codes, error location and correction, convolution codes.

TEXT BOOKS:

i. Digital communications - Simon Haykin, John Wiley, 2005.
ii. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.

REFERENCES:

i. Digital Communications – John Proakis, TMH, 1983.
ii. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004.
iii. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003

Course Outcomes:

After undergoing the course students will be able to:

i. Determine the performance of different waveform coding techniques
ii. Generate the digital representation of the signals.
iii. Determine the probability of error for various digital modulation schemes
iv. Analyze the prosperities viz., mutual information, entropy information rate, average information.
v. Calculate different parameters of source coding techniques

III Year I semester

L	T	P	C
3	1	0	3

ANTENNA AND WAVE PROPAGATION

Course Objectives:

i. Understand the applications of the electromagnetic waves in free space.
ii. Learn the working principles of various types of antennas
iii. Understand the concept of antenna arrays
iv. Understand the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
v. Understand the concepts of radio wave propagation in the atmosphere.

UNIT I: ANTENNA FUNDAMENTALS:

Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT II: THIN LINEAR WIRE ANTENNAS:

Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum.

UNIT III:

ANTENNA ARRAYS : 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations). Related Problems. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations.

Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and R_r relations for small loops.

UNIT IV:

Long wire antennas – field strength calculations and patterns

Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics.

Helical Antennas – Significance, Geometry, basic properties; Design considerations for

helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).
Reflector Antennas: Flat Sheet and Corner Reflectors. **Paraboloidal Reflectors** – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds.
Horn Antennas: Types, Optimum Horns, Design Characteristics of Pyramidal Horns;
Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications,
Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT V
WAVE PROPAGATION : Concepts of Propagation – frequency ranges and types of propagations. **Ground Wave Propagation**–Characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations.
Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Calculations for flat and spherical earth cases, Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption. Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations.
Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations, M-curves and Duct Propagation, Tropospheric Scattering.

TEXT BOOKS:
i. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
ii. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES :
i. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
ii. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

OUTCOMES:
After going through this course the student will be able to
i. Identify basic antenna parameters.
ii. Quantify the fields radiated by various types of antennas.
iii. Design and analyze antenna arrays and loop antennas.
iv. Design and analyze wire antennas, reflector antennas, lens antennas, horn antennas, micro strip antennas and antenna measurements to assess antenna's performance.
v. Identify the characteristics of radio wave propagation

III Year I semester	PROFESSIONAL ELECTIVE -1	L	T	P	C
		3	0	0	3

INFORMATION THEORY AND CODING TECHNIQUES

Course Objectives:

i. To prepare mathematical background for communication signal analysis.
ii. To understand and analyze Detection and Estimation in a digital communication system.
iii. To understand the concept of Linear Block codes,
iv. To understand the concept of Convolution Codes.
v. Analyze Performance of spread spectrum communication system

UNIT-I: INTRODUCTION TO INFORMATION THEORY:

Measure of information, source coding ,error free communication over a noisy channel, channel capacity of a discrete memory less channel, practical communication system in light of Shannon's equation, Frequency-selective channel capacity, Multiple input –multiple output communication systems

UNIT-II: DETECTION AND ESTIMATION:

Model of Digital Communication System, Gram-Schmitt Orthogonalization procedure, Geometric Interpretation of signals, Response of Bank Correlators to Noisy input, Detections of Known signal in noise, Probability error, Correlation receiver, Matched filter receiver, Detection of signals with unknown Phase and Noise, Estimation: Concepts and criteria, Maximum likelihood Estimation, Wiener Filter for wave form estimation

UNIT-III: GROUPS, FIELDS AND LINEAR BLOCK CODES:

Galois field and its construction in GF(2^m) and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSc, Hamming code and their applications.

UNIT-IV: CYCLIC CODES AND BCH CODES:

Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction, Convolution Codes

UNIT-V: SPARED SPECTRUM MODULATION:

Pseudo Noise sequences, A notion of Spared spectrum, Discrete-sequence spared Coherent binary phase shift keying, Signal-phase Dimensionality and processing Gain, Probability of error, Frequency hope-Spared Spectrum, Applications

TEXT BOOKS:

i. Simon Haykin, "communication Systems", 4th Edition, John Wiley and Sons, 2001.
ii. Lathi B.P., Modern Analog and Digital communication Systems, Oxford Univ.

REFERENCES:

i. Shu Lin and Costello, “Error Control coding: Fundamentals and Applications”, 2nd Edition, Pearson.
ii. Sklar, “Digital Communication”, Pearson Education Asia.
iii. Schaum's Outline Series, “Analog and Digital Communication”, TMH.

Course Outcomes:

i. To understand mathematical background for communication signal analysis.
ii. To understand and analyze Detection and Estimation in a digital communication system.
iii. To design different types of Linear Block codes,
iv. To construct different types of Convolution Codes.
v. Analyze Performance of spread spectrum communication system

III Year I semester **PROFESSIONAL ELECTIVE -1**

L	T	P	C
3	0	0	3

SPEECH AND AUDIO PROCESSING

Course Objectives:

i. To study fundamentals of human speech and music analysis,
ii. to model and process digital filters for speech encoding.
iii. To study the process of digitized human speech, the importance of adequate voiced and unvoiced speech sounds grouped into phonemes,
iv. To study the spectrograms for speech recognition, articulation and understanding. Also to learn - how the dominant features of speech may be analyzed to form significant abstractions for speaker identification and speaker-independent linguistic comprehension.
v. To study text to speech conversion system, different Synthesizer technologies, Emotion recognition from speech, watermarking of a speech signal

UNIT-I: FUNDAMENTALS OF SPEECH:

The human speech production mechanism, LTI model for speech production, Nature of speech signal, Linear time inverting model ,Phonetics, types of speech, voice and unvoiced decision making, Audio file Formats

UNIT-II: LINEAR PREDICTION OF SPEECH:

Lattice structure realization, forward linear prediction, autocorrelation method, Covariance method, Lattice methods, selection of the order of the predictor, line spectral frequencies

UNIT-III: SPEECH QUANTIZATION AND CODING:

Uniform and non uniform quantizers and coders, Companded quantizer, Uniform quantization and non uniform sources, waveform coding of speech,Pulse code modulation (PCM), Companded PCM, Adaptive PCM,DPCM,ADPCM, Comparison of different waveform coding techniques,Parametric speech coding techniques,Sinusoidal speech coding techniques,mixed excitation linear prediction coder, Multi mode speech coding ,Transfer domain coding of speech.

UNIT-IV: SPEECH PROCESSING APPLICATIONS:

Speech recognition systems, Architecture of large vocabulary continuous speech recognition system, Deterministic sequence recognition of SAR, Statical recognition of SAR, Statical pattern recognition and Parameter estimation, Word spotting ,keyboard spotting, Speech recognition and understanding, Speaker recognition, Distortion measures

UNIT-V: SPEECH SYNTHESIS

Atext to speech system,Synthesizer technologies,Speech synthesis using other methods,speech transformations,Emotion recognition from speech,watermarking of authentication of a speech signal

Textbooks:

i. Dr. Shaila,D.Apte, "Speech and audio processing "Wiley Publications
ii. Rabiner, L.R. and Schafer, R.W., "Digital Processing of Speech Signals", Pearson Education,2006.
iii. Quatieri, T.F., "Discrete-Time Speech Signal Processing: Principles and Practice", Pearson Education, 2002.

Reference Books:

i. Spanias, A., Painter, T. and Venkatraman, A., "Audio Signal Processing and Coding", John Wiley & Sons,2007.
ii. Gold, B. and Morgan, N., "Speech and Audio Signal Processing", John Wiley & Sons,2002.

Course Outcomes:

After the course, the student able to

i. Design and implement algorithms for processing audio and speech signals using MATLAB.
ii. Take into account the properties of acoustic signals and human hearing in the design of audio signal processing systems.
iii. Operate the speech production apparatus and different models
iv. Estimate the effect of the signal representations on sound quality, also can Perform common audio signal processing operations (equalization, dynamic control, perceptual audio coding.
v. Perform text to speech conversion and speech synthesis, speech watermarking

III Year I semester **PROFESSIONAL ELECTIVE -1**

L	T	P	C
3	0	0	3

WIRELESS COMMUNICATIONS

Course Objectives:

i. An understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards
ii. An ability to compare recent technologies used for wireless communication.
iii. An ability to explain the architecture, functioning, protocols, capabilities and application of Various wireless communication networks
iv. An ability to explain multiple access techniques for Wireless Communication
v. An ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

UNIT I:

Overview of wireless communication, cellular communication, different generations and standards in cellular communication system, satellite communication including GPS, wireless local loop, cordless phone, paging systems, RFID.

UNIT II:

Recent wireless technologies: multicarrier modulation, OFDM, MIMO system, diversity multiplexing trade-off, MIMO-OFDM system, smart-antenna; beam forming and MIMO, cognitive radio, software defined radio, communication relays, spectrum sharing.

UNIT III:

Multiple access techniques in wireless communication: contention-free multiple access schemes (FDMA TDMA, CDMA, SDMA and Hybrid), contention-based multiple access schemes (ALOHA and CSMA).

UNIT IV:

Wireless personal area networks (Bluetooth, UWB and ZigBee), wireless local area networks (IEEE 802.11, network architecture, medium access methods, WLAN standards), wireless metropolitan area networks (WiMAX).

UNIT V:

Ad-hoc wireless networks: Design Challenges in Ad-hoc wireless networks, concept of cross layer design, security in wireless networks, energy constrained networks. MANET and WSN. Wireless system protocols: mobile network layer protocol (mobile IP, IPv6, dynamic host configuration protocol), mobile transport layer protocol (traditional TCP, classical TCP improvements), support for mobility (wireless application protocol).

Text Books:

i. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.
ii. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts” River Publishers, Denmark, 2015 (Indian reprint).

Reference Books:

i. Vijay K Garg, “Wireless Communications and Networks”, Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indian reprint) .
ii. J. Schiller, “Mobile Communication” 2/e, Pearson Education, 2012.
iii. Iti Saha Misra, “Wireless Communication and Networks: 3G and Beyond”, 2/e, McGraw Hill Education (India) Private Ltd, New Delhi, 2013.

Course Outcomes:

On the completion of this course, the students will be able to:

i. Demonstrate their understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards.
ii. Compare different technologies used for wireless communication systems.
iii. Explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks.
iv. Demonstrate an ability explain multiple access techniques for Wireless Communication
v. Demonstrate an ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

III Year - I Semester

L	T	P	C
0	0	3	1.5

Linear and Digital IC Applications LAB

COURSE OBJECTIVES:

i. Students will be able to design the circuits for different applications using Op-Amp
ii. Students will design various filters and waveform generators
iii. Students will Illustrate various applications of ICs
iv. Students will Acquire skills required to HDL coding for combinational circuits
v. Students will Acquire skills required to HDL program for sequential circuits& state machines

Note: To perform any Twelve experiments (choosing at least six from each part).

Part - I: Linear IC Experiments

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Waveform Generators - Sine, Squarewave and Triangular waves.
5. IC 555 Timer - Monostable and Astable Multivibrator Circuits.
6. Schmitt Trigger Circuits - Using IC 741
7. IC 565 - PLL Applications.
8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators - 7805, 7809, 7912.

EQUIPMENT REQUIRED:

1. 20 MHz / 40 MHz / 60 MHz Oscilloscope.
2. 1 MHz Function Generator (Sine, Square, Traingular and TTL).
3. Regulated Power Supply.
4. Multimeter / Volt Meter.

Part - II: HDL Simulation programs:

Programming can be done using any compiler. Download the programs on FPGA / CPLD boards and performance testing may be done using pattern generator / logic analyzer apart from verification by simulation using Cadence / Mentor Graphics / Synopsys / Equivalentfront end CAD tools.

1. HDL code to realize all the logic gates
2. Design of 2-to-4 decoder
3. Design of 8-to-3 encoder (without and with Priority)
4. Design of 8-to-1 multiplexer and 1 x 8 demuliplexer.
5. Design of 4 bit binary to gray code converter

6. Design of 4 bit comparator
7. Design of Full adder using 3 modelling styles
8. Design of flip flops: SR, JK, T
9. Design of 4-bit binary, BCD counters (synchronous/ asunchronous reset)
10. Finite State Machine Design

COURSE OUTCOMES:

i. Design circuits using operational amplifiers for various applications.
ii. Analyze and design waveform generators and active filters using Op-amp.
iii. Design circuits for various applications of ICs
iv. Design and implement HDL program structure of combinational circuits
v. Design and implement behavioral modelling of sequential circuits.

III Year - I Semester

L	T	P	C
0	0	3	1.5

DIGITAL COMMUNICATIONS LAB

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying .
7. Differential phase shift keying.
8. Companding
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code – Encoder and Decoder
12. Convolution Code – Encoder and Decoder

Equipment required for Laboratories:

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 M Hz
4. RF Generators – 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components

III Year - I Semester

L	T	P	C
0	0	3	1.5

MICROPROCESSORS AND MICROCONTROLLERS LAB

LIST OF EXPERIMENTS

PART- A: (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programming using Assembler Directives

15. Sorting.
16. Multibyte addition/subtraction
17. Sum of squares/cubes of a given n-numbers
18. Addition of n-BCD numbers
19. Factorial of given n-numbers
20. Multiplication and Division operations
21. Stack operations
22. BCD to Seven segment display codes

PART- B: (Minimum of 3 Experiments has to be performed)

8086 Interfacing

1. Hardware/Software Interrupt Application
2. A/D Interface through Intel 8255
3. D/A Interface through Intel 8255
4. Keyboard and Display Interface through Intel 8279
5. Generation of waveforms using Intel 8253/8254

PART- C: (Minimum of 3 Experiments has to be performed)

8051 Assembly Language Programs

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Addition of even numbers from a given array
3. Ascending / Descending order
4. Average of n-numbers

PART-D: (Minimum of 3 Experiments has to be performed)

8051 Interfacing

1. Switches and LEDs
2. 7-Segment display (multiplexed)
3. Stepper Motor Interface
4. Traffic Light Controller

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segemt Units
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.

III Year - I Semester

L	T	P	C
3	0	0	0.5

Seminars

III Year - II Semester

L	T	P	C
3	0	0	3

MICROWAVE ENGINEERING

Course Objectives:

i. Understand fundamental characteristics of waveguides and Micro strip lines through electromagnetic field analysis.
ii. Understand the basic properties of waveguide components and Ferrite materials composition
iii. Understand the function, design, and integration of the major microwave components oscillators, power amplifier.
iv. Understand the operation of microwave solid state devices.
v. Understand a Microwave test bench setup for measurements.

UNIT I :

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Mode Characteristics – Phase and Group Velocities, Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Related Problems.

MICROSTRIP LINES– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT II: WAVEGUIDE COMPONENTS AND S-PARAMETERS:

Coupling Mechanisms – Probe, Loop, Aperture types. Matched Loads,Movable sort, Waveguide twists, Waveguide Attenuators, Phase Shifters. Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for –E-plane and H-plane Tees, Magic Tee, Hybrid Ring, Two-hole Directional Coupler, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT III:

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 – Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –Expressions for o/p Power and Efficiency,Reflex Klystrons – Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Related Problems. Helix Travelling - wave Tubes (TWTs) - Slow Wave Structures,Suppression of Oscillations, Nature of the four Propagation Constants.

M-type Tubes
Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off and HartreeConditions, PI-Mode Operation, Separation of PI-Mode.

UNIT IV: MICROWAVE SOLID STATE DEVICES:
Introduction, Classification, Applications. TEDs – Gunn Diode – Principle, RWH Theory, Characteristics. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

UNIT V: MICROWAVE MEASUREMENTS:
Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q-factor, Phase shift, VSWR, Impedance Measurement.

TEXT BOOKS:
i. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
ii. 2Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.

REFERENCES:
i. Microwave and radar engineering –M. Kulakarni, umesh publications 4^{th} editions 2009.
ii. Microwave Engineering- Annapurna Das and SisirK.Das, Mc Graw Hill Education,3^{rd} Edition.
iii. Microwave Engineering – G S N Raju , I K International Publications 2^{nd}Edition, 2008.

OUTCOMES:
The students shall able to
i. Design different modes in waveguide structures
ii. Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
iii. Distinguish between Microwave tubes and calculation of efficiency of devices.
iv. Apply theprinciple of operation and features of Solid State Devices.
v. Measure various microwave parameters using a Microwave test bench

III Year - II Semester

L	T	P	C
3	0	0	3

VLSI DESIGN

COURSE OBJECTIVES:

The main objectives of this course are:

i. Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
ii. Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
iii. Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.
iv. Understand the concepts of scaling MOS circuits
v. Understand FPGA design, synthesis and different case studies

UNIT-I:

Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabricationprocess: nMOS, pMOS and CMOS. I_{DS}vs V_{DS} Relationships, MOS Transistor Threshold Voltage, MOS transistor parameters, nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.

UNIT-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, Generalobservations on the Design rules, 2µ m Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µ m Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams- Translation to Mask Form.

UNIT-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, AreaCapacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, InverterDelays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

UNIT-IV:

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density,
Introduction to Switch logic and Gate logic.

UNIT-V:

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA Modes of operation, FPGA families-Xilinx XC4000 series FPGA, Xilinx Spartan II FPGAs, Xilinx Vertex FPGA.

Case studies: FPGA Implementation of Half adder and full adder.

Introduction to synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

TEXTBOOKS:

i. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas, and A. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
ii. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education.

REFERENCES:

i. 1.CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw- Hill Education, 2003.
ii. 2.Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3rd Edition, DavidHodges.

COURSE OUTCOMES:

At the end of this course the student can be able to:

i. Understand the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be interconnected in silicon.
ii. Know three sets of design rules with which nMOS and CMOS designs may be fabricated.
iii. Understand the scaling factors determining the characteristics and performance of MOS circuits in silicon technology.
iv. Know about scaling of MOS circuits
v. Know about FPGA design, synthesis and different case studies

III Year - II Semester

L	T	P	C
3	1	0	3

DIGITAL SIGNAL PROCESSING

OBJECTIVES

The student will be able to

i. Analyze the Discrete Time Signals and Systems
ii. Know the importance of FFT algorithm for computation of Discrete Fourier Transform
iii. Learn the IIR Filter design procedures and Understand the various implementations of digital filter structures
iv. Learn the FIR Filter design procedures and Understand the various implementations of digital filter structures
v. Know the need of Multirate Processing,Learn the concepts of DSP Processors

UNIT I INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems , stability of LTI systems, , Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II DISCRETE FOURIER SERIES &FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT,Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Applications of FFT.

UNIT III. DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:

Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters.Basic structures of FIR systems, Finite word length effects.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation , Interpolation Sampling rate conversion ,Implementation of sampling rate converters**,**

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

i. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis,Pearson Education / PHI, 2007.
ii. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

Reference Books:

i. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
ii. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
iii. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra

OUTCOMES

After going through this course the student will be able to

i. Apply the difference equations concept in the anayziation of Discrete time systems
ii. Use the FFT algorithm for solving the DFT of a given signal
iii. Design a Digital filter (IIR) from the given specificationsRealize the IIR structures from the designed digital filter.
iv. Design a Digital filter (FIR) from the given specifications Realize the FIR structures from the designed digital filter
v. Use the Multirate Processing concepts in various applications(eg: Design of phase shifters, Interfacing of digital systems…)Apply the signal processing concepts on DSP Processor.

III Year II semester **PROFESSIONAL ELECTIVE -2**

L	T	P	C
3	0	0	3

MOBILE CELLULAR COMMUNICATIONS

Course Objectives

The student will be introduced to:

i. Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
ii. Understand the different types of interferences influencing cellular and mobile communications.
iii. Understand the concept of propagation model and the different types antennas used at cell site and mobile
iv. Understand the frequency management, channel assignment, various propagation effects in cellular environment and the concepts of handoff and types of handoffs.
v. Understand the architectures of GSM and 3G cellular systems.

UNIT I

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II

INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-cochannel interference-different types.

UNIT III

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, antenna height gain, form of a point-to-point model.

CELL SITE AND MOBILE ANTENNAS: Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT IV

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

HANDOFF STRATEGIES: Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and their evaluation.

UNIT V

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA; architecture of 3G cellular systems.

TEXTBOOKS:

i. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
ii. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

REFERENCES:

i. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
ii. Mobile Cellular Communication – G Sasibhushana Rao Pearson

Course Outcomes:

At the end of this course the student can able to:

i. Explain the fundamentals of cellular radio system design and its basic elements.
ii. Analyse the concepts of different co-channel, non-co-channel interference and cellular coverage on signal & traffic of a designed system.
iii. Identify the various types of antenna system design suitable for mobile communications.
iv. Distinguish the number of radio channels, channel assignment and frequency management used in mobile communications and Analyse the different hand off & cell splitting techniques and dropped call rate at cell site area.
v. Summarize the different types of second generation system architectures such as GSM, TDMA and CDMA for mobile communication systems.

III Year II semester **PROFESSIONAL ELECTIVE -2**

L	T	P	C
3	0	0	3

MIMO COMMUNICATIONS

Course Objectives

i. Introduce Multiple Input Multiple Output (MIMO) Communication Systems .
ii. To understand MIMO Systems.
iii. Discuss the advantages of MIMO Systems.
iv. Understand the spatial multiplexing properties of MIMO.
v. Introduce space time codes.

UNIT-I

Information Theoretic aspects of MIMO: Review of SISO fading communication channels, MIMO channel models, Classical i.i.d. and extended channels, Frequency selective and correlated channel models, Capacity of MIMO channels, Ergodic and outage capacity, Capacity bounds and Influence of channel properties on the capacity

UNIT II

MIMO Diversity and Spatial Multiplexing: Sources and types of diversity, analysis under Rayleigh fading, Diversity and channel knowledge. Alamouti space time code, MIMO spatial multiplexing. Space time receivers. ML, ZF, MMSE and Sphere decoding, BLAST receivers and Diversity multiplexing trade-off.

UNIT III

Space Time Block Codes: Space time block codes on real and complex orthogonal designs, Code design criteria for quasi-static channels (Rank, determinant and Euclidean distance), Orthogonal designs, Generalized orthogonal designs, Quasi-orthogonal designs and Performance analysis.

UNIT IV

Space Time Trellis Codes: Representation of STTC, shift register, generator matrix, state-transition diagram, trellis diagram, Code construction, Delay diversity as a special case of STTC and Performance analysis.

UNIT V

CONCATENATED CODES AND ITERATIVE DECODING: Development of concatenated codes, Concatenated codes for AWGN and MIMO channels, Turbo coded modulation for MIMO channels, Concatenated space-time block coding. Matlab exercise

Text Books

i. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press 2005
ii. Hamid Jafarkhani, “Space-Time Coding: Theory and Practice”, Cambridge University Press 2005.

Reference Books:

i. Paulraj, R. Nabar and D. Gore, “Introduction to Space-Time Wireless Communications”, Cambridge University Press 2003
ii. Ezio Biglieri , Robert Calderbank et al “MIMO Wireless Communications” Cambridge University Press 2007

Course Outcome:

After learning the course, the students should be able to:

i. Introduce Multiple Input Multiple Output (MIMO) Communication Systems
ii. Compare MIMO Systems with Single Input Single Output (SISO) Systems
iii. Analyse the Information Theoretic advantages of MIMO Systems
iv. Analyse the spatial multiplexing properties of MIMO
v. Introduce and analyse space time codes

III Year II semester **PROFESSIONAL ELECTIVE -2**

L	T	P	C
3	0	0	3

WIRELESS SENSORS AND NETWORKS

Course Objectives:

i. Explain the Fundamental Concepts of Wireless Sensor Networks
ii. Describe the MAC Protocol Issues for Wireless Sensor Networks
iii. Describe Routing Protocols Wireless Sensor Networks
iv. Describe transport layer and security Protocols for Wireless Sensor Networks
v. Discuss the security in WSN and applications

UNIT I

Introduction to Wireless Networks, Architectures and Technologies: Key definitions of sensor networks, Advantages, challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts. Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT-II

MAC Protocols for Wireless Sensor Networks: Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals, Classifications of MAC Protocols, Contention - Based Protocols, with reservation Mechanisms, Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT-III

Routing Protocols:Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.

UNIT-IV

Transport Layer and Security Protocols:Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT- V

Security in WSNs:Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

Sensor Network Platforms and Tools:Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Applications of WSN:S-Ultra-wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications

TEXT BOOKS:

i. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
ii. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

REFERENCES:

i. Kazem Sohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
ii. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
iii. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

Course Outcomes

After Completing the Course, students

i. Understand and explain common wireless sensor node architectures.
ii. Demonstrate knowledge of MAC protocols developed for WSN.
iii. Demonstrate knowledge of routing protocols developed for WSN.
iv. Demonstrate knowledge of transport and security protocols developed for WSN
v. Be familiar with WSN standards and applications.

III Year II semester **OPEN ELECTIVE -1** **L T P C**
3 0 0 3

COMPUTER NETWORKS & SECURITY

Course Objectives:

i. To introduce the fundamental various types of computer networks.
ii. To understand state-of-the-art in network protocols, architectures, and applications.
iii. To explore the various layers of OSI Model.
iv. To introduce UDP and TCP Models.
v.

UNIT-I:

Introduction: Network Hardware and software **Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.**

Physical Layer: Guided Transmission Media, Digital Modulation and Multiplexing: frequency division multiplexing, wave length division multiplexing, synchronous time division multiplexing, statistical time division multiplexing.

UNIT-II:

The Data Link Layer - Design Issues, Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols, Sliding Window Protocols.

Channel allocation methods: TDM, FDM, ALOHA, Carrier sense Multiple access protocols, Collision Free protocols – IEEE standard 802 for LANS – Ethernet, Token Bus, Token ring, Bridges and IEEE 802.11 and 802.16. Data link layer switching, virtual LANs.

UNIT-III:

Network layer Routing Algorithms: Design Issues, Routing Algorithms-Shortest path, Flooding, Flow based Distance vector, Link state, Hierarchical, Broadcast routing, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Choke packets, Load shedding, and Jitter Control.

Internet Working : Tunnelling, internetworking, Fragmentation, Network layer in the internet – IP protocols, IP address, Subnets, Internet control protocols, OSPF, BGP, Internet multicasting, Mobile IP, IPV6.

UNIT IV:

The Transport Layer: Elements of transport protocols – addressing, establishing a connection, releasing connection, flow control and buffering and crash recovery, End to end protocols: UDP, Real Time Tran sport Protocol.

The Internet Transport Protocol: TCP- reliable Byte Stream (TCP) end to end format, segment format, connection establishment and termination, sliding window revisited, adaptive retransmission, TCP extension, Remote Procedure Call.

UNIT – V:

Application Layer: WWW and HTTP: Architecture- Client (Browser), Server, Uniform Resource Locator HTTP: HTTP Transaction, HTTP Operational Model and Client/Server Communication**,** HTTP Generic Message Format, HTTP Request Message Format, HTTP Response Message Format.

The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery.

Text Books:

i. **Data Communications and Networks – Behrouz A. Forouzan, Third Edition TMH.**
ii. **Computer Networks, 5ed, David Patterson, Elsevier**

References:

i. **Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010**
ii. **Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education**
iii. **An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education**

Course Outcomes:

The students are able to

i. Understand OSI and TCP/IP reference models with an emphasis to Physical Layer, Data Link Layer and Network Layer.
ii. Analyze the issues related to data link, medium access and transport layers by using channel allocation and connection management schemes.Analyze MAC layer protocols and LAN technologies.
iii. Solve problems related to Flow control, Error control, Congestion control and Network Routing.
iv. Design and compute subnet masks and addresses for networking requirements.
v. Understand how internet works,

III Year II semester **OPEN ELECTIVE -1**

L	T	P	C
3	0	0	3

Fundamentals of Cloud Computing

Course Objective:

i. Cloud Computing is a large scale distributed computing paradigm which has become a driving force for information technology over the past several years.
ii. This course introduce cloud computing technology to undergraduate engineering students, so they can learn, apply and use this technology in their future careers.
iii.
iv.
v.

UNIT-I: Computing Paradigms:
High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II: Cloud Computing Fundamentals:
Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud Computing, Cloud Computing is a Service, Cloud Computing is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT-III: Cloud Computing Architecture and Management:
Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud Application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV: Cloud Service Models:
Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platformas a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT-V:

Cloud Providers and Applications: EMC, EMC IT, Captiva Cloud Toolkit, Google Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP

HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rackspace, VMware, Manjra soft, Aneka Platform**.**

Text Book:

i. Essentials of Cloud Computing, K. Chandrasekhran, CRC press.

Reference Books:

i. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley.
ii. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier.
iii. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly.

Course Outcomes

Upon completion of the course, it is expected that student will be able to:

i. Understand and analyze different computing paradigms
ii. Understand the basics of cloud computing and different cloud deployment models.
iii. Understand different cloud implementation and management strategies.
iv. Understand and evaluate different cloud service models.
v. Identify, analyze and use different cloud services/applications/tools available from key cloud providers.

III Year II semester	OPEN ELECTIVE -1	L	T	P	C
		3	0	0	3

IOT Engineering

Course Objectives:

i. To Understand Smart Objects and IoT Architectures.
ii. To learn about various IOT-related protocols
iii. To build simple IoT Systems using Arduino and Raspberry Pi.
iv. To understand data analytics and cloud in the context of IoT
v. To develop IoT infrastructure for popular applications.

UNIT I: FUNDAMENTALS OF IoT:
Evolution of Internet of Things, Enabling Technologies, IoT Architectures,oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II: IoT PROTOCOLS:
IT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT III: DESIGN AND DEVELOPMENT: Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.

UNIT IV: DATA ANALYTICS AND SUPPORTING SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning – No SQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG.

UNIT V: CASE STUDIES/INDUSTRIAL APPLICATIONS: Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Text Books:

1.IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017

Reference Books:

1. Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015

2. The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit 2).

3. "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.

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

i. Summarize on the term 'internet of things' in different contexts.
ii. Analyze various protocols for IoT.
iii. Design a PoC of an IoT system using Rasperry Pi/Arduino
iv. Apply data analytics and use cloud offerings related to IoT.
v. Analyze applications of IoT in real time scenario

III Year - II Semester

L	T	P	C
0	0	3	1.5

VLSI LABORATORY

Note: The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

List of Experiments:

i. Design and Implementation of an Universal Gates
ii. Design and Implementation of an Inverter
iii. Design and Implementation of Full Adder
iv. Design and Implementation of Full Subtractor
v. Design and Implementation of Decoder
vi. Design and Implementation of RS-Latch
vii. Design and Implementation of D-Latch
viii. Design and Implementation asynchronous counter
ix. Design and Implementation of static RAM cell
x. Design and Implementation of 8 bit DAC using R-2R latter network

Software Required:

i. Mentor Graphics Software / Equivalent Industry Standard Software.
ii. Personal computer system with necessary software to run the programs and to implement.

III Year - II Semester

L	T	P	C
0	0	3	1.5

DIGITAL SIGNAL PROCESSING LABORATORY

LIST OF EXPERIMENTS:

1) GENERATION OF DISCRETE TIME SIGNALS FOR DISCRETE SIGNALS
2) TO VERIFY LINEAR CONVOLUTION.
3) TO VERIFY THE CIRCULAR CONVOLUTION.
4) TO FIND THE ADDITION OF SINUSOIDAL SIGNALS.
5) TO VERIFY DISCRETE FOURIER TRANSFORM (DFT) AND INVERSE DISCRETE FOURIER TRANSFORM (IDFT).
6) FREQUENCY RESPONSE OF IIR LOW PASS BUTTERWORTH FILTER
7) FREQUENCY RESPONSE OF IIR HIGH PASS BUTTERWORTH FILTER
8) FREQUENCY RESPONSE OF IIR LOW PASS CHEBYSHEV FILTER
9) FREQUENCY RESPONSE OF IIR HIGH PASS CHEBYSHEV FILTER
10) FREQUENCY RESPONSE OF FIR LOW PASS FILTER USING RECTANGLE WINDOW
11) FREQUENCY RESPONSE OF FIR LOW PASS FILTER USING TRIANGLE WINDOW
12) N-POINT FFT ALGORITHM.
13) TO COMPUTE POWER DENSITY SPECTRUM OF A SEQUENCE.
14) TO FIND THE FFT OF GIVEN 1-D SIGNAL AND PLOT.
15) TO STUDY THE ARCHITECTURE OF DSP CHIPS – TMS 320C 5X/6X INSTRUCTIONS.

III Year - II Semester

L	T	P	C
0	0	3	1.5

MICROWAVE ENGINEERING & OPTICAL COMMUNICATION ENGINEERING LAB

Minimum Twelve Experiments to be conducted:

Part – A (Any 7 Experiments (8 & 9 compulsory)) :

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. Impedance and Frequency Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.
9. Synthesis of Microstip antennas (Rectangular Structure) Using HFSS.

Part – B (Any 5 Experiments) :

10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1. Regulated Klystron Power Supply, Klystron mount
2. VSWR Meter
3. Micro Ammeter
4. Multi meter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Crystal Diode detector
8. Micro wave components (Attenuation)
9. Frequency Meter
10. Slotted line carriage
11. Probe detector
12. Wave guide shorts
13. SS Tuner
14. Directional Coupler
15. E, H, Magic Tees
16. Circulators, Isolator
17. Matched Loads

18. Pyramidal Horn and Parabolic Antennas
19. Turntable for Antenna Measurements
20. HFSS Software
21. Fiber Optic Analog Trainer based LED
22. Fiber Optic Analog Trainer based laser
23. Fiber Optic Digital Trainer 24. Fiber cables - (Plastic, Glass)

III Year - II Semester

L	T	P	C
0	0	3	1

Mini project with hardware development

IV Year I semester

L	T	P	C
3	0	0	3

RADAR ENGINEERING

OBJECTIVES: The student shall be able to

i. Understand about the basics of RADAR.
ii. Learn about different types of Radars
iii. Learn about MTI Radars
iv. Learn about Tracking Radars
v. Learn about Radar Receivers

Pre requisites: Antennas and wave propagation; Microwave Engineering, Fundamentals of Electromagnetics and Communications

UNIT – I

Introduction: Nature of Radar. Maximum Unambiguous Range. Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Related Problems. Radar Equation: Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets-sphere, cone-sphere). Transmitter power.

UNIT – II

PRF and Range Ambiguities, System Losses (Qualitative treatment). Related Problems. CW and Frequency Modulated Radar: Doppler effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirement, Applications of CW radar. FMCW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Measurement Errors, Multiple Frequency CW Radar.

UNIT – III

MTI and Pulse Doppler Radar: Introduction, Principle, MTIR Radar with- 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. Non-coherent MTI, MTI versus Pulse Doppler Radar. Tracking Rader : Tracking with Rader, Sequential Lobing, Conical Scan, Mono-pulse Tracking.

UNIT – IV

Radar Amplitude Comparison Mono-pulse (one – and two –coordinates), Phase Comparison Mono-pulse. Target Reflection Characteristics and Angular Accuracy. Tracking in Range Acquisition and Scanning Patterns. Comparison of Trackers. Radar Antennas – Antenna Parameters, Reflector Antennas, Lens Antennas, Lens Antennas Cosecant- Squared Antenna Pattern, Radomes.

UNIT- V

Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Detection of Radar Signals in Noise: Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Radar Receivers – Noise Figure and Noise Temperature. Displays – types. Duplexer – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas- Basic Concepts, Radiation Pattern. Beam Steering and Beam Width changes, Series versus Parallel Feeds. Applications, Advantages and Limitations.

TEXT BOOKS:

i. Introduction to Radar Systems – Merrill I. Skolnik, SECOND EDITION, McGraw – Hill, 1981.
ii. Radar Engineering and fundamentals of Navigational Aids- G.S.N.Raju, I.K International, 2008.

REFERENCES:

i. Introduction to Radar Systems – Merrill I. Skolnik, THIRD EDITION, Tata McGraw – Hill, 2001.
ii. Radar: Principles, Technologies, Applications- Byron Edde, Pearson Education.

OUTCOMES

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

i. Acquire the knowledge to apply required parameters for a RADAR system.
ii. Apply the techniques learned, to choose suitable RADAR from the available, for the required application.
iii. Apply the processes learned, to differentiate features between different RADARS.
iv. Choose the suitable Radar for given requirements.
v. Understand how to apply Matched filter concept in Radar system design.

IV Year I semester

L	T	P	C
3	0	0	3

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

COURSE OBJECTIVES:

i. To familiarize the characteristics and operation of measuring instruments.
ii. To introduce the concepts of active and passive transducers.
iii. To get an exposure on different signal generators and analyzers
iv. To understand the measurement of bridges
v. Students gain knowledge on different oscilloscopes and their functioning

UNIT I

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multi-meter for Voltage, Current and resistance measurements.

UNIT II

Signal Generator- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO,

UNIT IV

AC Bridges Measurement of inductance- Maxwell’s bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors, and precautions in using bridges. Q-meter.

UNIT V

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed.

TEXTBOOKS :

i. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
ii. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :

i. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
ii. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.

COURSE OUTCOMES

The student will be able to

i. Select the instrument to be used based on the requirements.
ii. Understand and analyze different signal generators and analyzers.
iii. Understand the design of oscilloscopes for different applications.
iv. Design different transducers for measurement of different parameters.
v. Analyze and understand the measurement of bridges along with errors and precautions in using bridges.

IV Year I semester

L	T	P	C
3	0	0	3

FIBER OPTIC COMMUNICATION

Course Objectives:

i. To realize the significance of optical fiber communications.
ii. To understand the construction and characteristics of optical fiber cable.
iii. To develop the knowledge of optical signal sources and power launching.
iv. To identify and understand the operation of various optical detectors.
v. To under the design of optical systems and WDM.

UNIT I

Optical Fiber Communications: Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Ray theory transmission, Modes in planar guide, phase and group velocity, cylindrical Fiber -Modes.Fiber materials, Fiber fabrication techniques, fiber optic cables, Classification of Optical Fibers: Single mode fibers, Graded Index fibers.

UNIT II

SIGNAL DISTORTION IN OPTICAL FIBERS: -Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion, pulse broadening.

Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Optical Fiber Splicing.

UNIT III

OPTICAL SOURCES: Intrinsic and extrinsic material-direct and indirect band gaps-LED-LED structures-surface emitting LED-Edge emitting LED-quantum efficiency and LED power-light source materials-modulation of LED.

LASER diodes- modes and threshold conditions-Rate equations-external quantum efficiency-resonant frequencies-structures and radiation patterns-single mode laser-external modulation-temperature effects.

UNIT IV

OPTICAL DETECTORS AND RECEIVERS: Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.

Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration.

UNIT V

OPTICAL SYSTEM DESIGN: Considerations, Component choice, Multiplexing, Point-to-point links, System considerations, Link power budget with examples. Rise time budget with examples. WDM –Passive DWDM Components-Elements of optical networks-SONET/SDH

TEXT BOOKS:

i. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
ii. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCES:

i. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
ii. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Ediition, 2004.

Course Outcomes

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

i. Understand and analyze the constructional parameters of optical fibers.
ii. be able to design the optical system.
iii. Estimate the losses due to attenuation, absorption, scattering and bending.
iv. Compare various optical detectors and choose suitable one for different applications.
v. Able to demonstrate the design of WDM

IV Year I semester

L	T	P	C
3	0	0	3

Digital Image and Video Processing

Course Objectives:

i. To study the image fundamentals and mathematical transforms necessary for image Processing.
ii. To familiarize with image enhancement techniques in spatial and frequency domain, to study the need for image restoration and different restoration models/techniques.
iii. To learn the fundamentals of image segmentation and compression procedures, to study different segmentation and compression models.
iv. To understand the basics of image morphologies and different color models.
v. To learn the basic steps of Video processing.

UNIT I: Fundamentals of Image Processing:

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing.

Image Transforms: Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.

UNIT II:

Image Enhancement:

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration:

Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind de convolution.

UNIT III:

Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour

Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.

UNIT-IV:

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

UNIT V:

Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

2-D Motion Estimation: Optical flow, General Methodologies, different motion estimation models.

TEXT BOOKS:

i. Digital Image Processing – Gonzaleze and Woods, 4th Ed., Pearson.
ii. Digital Video Processing – M. Tekalp, Prentice Hall International.
iii. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, "Digital Image processing, TataMcGraw Hill publishers, 2009

REFRENCE BOOKS:

i. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
ii. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2ndEd, Elsevier.
iii. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
iv. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PH Int.
v. https://nptel.ac.in/courses/117/105/117105135/

Course Outcomes:

After completion of the course, the student will able to

i. Perform the basic operations on images and can compute different image transforms.
ii. Perform image enhancement in spatial and frequency domain, be able to restore the given degraded image.
iii. Segment and compress the given image using different techniques.
iv. Perform different morphological operations on images and image color inter conversions.
v. Differentiate analog and digital video, perform sampling and filtering of video signals using different models.

IV Year I semester	PROFESSIONAL ELECTIVE -3	L	T	P	C
		3	0	0	3

EMBEDDED SYSTEMS

COURSE OBJECTIVES:

The main objectives of this course are given below:

i. The basic concepts of an embedded system are introduced.
ii. The various elements of embedded hardware and their design principles are explained.
iii. Different steps involved in thedesignand development of firmware forembedded systems are elaborated.
iv. Internals of Real Time operating system and the fundamentals of RTOS based embedded firm ware design is discussed. And Fundamental issues in hardware software co-design were presented and explained.
v. FamiliarisewiththedifferentIDEsforfirmwaredevelopmentfordifferentfamilyofprocessors/controllers and embedded operating systems. And Embedded system implementation and testing tools are introduced and discussed.

UNIT-I: INTRODUCTION:
Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface ,Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II: EMBEDDEDHARDWAREDESIGN:
Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III: EMBEDDED FIRMWARE DESIGN:
Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV: REAL TIME OPERATING SYSTEM:
Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation, Device Drivers.

HARDWARESOFTWARECO-DESIGN: Fundamental Issues in Hardware Software Co-Design Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT-V

EMBEDDEDSYSTEMDEVELOPMENTAND

TESTING:: The integrated development environment, Types of files generated on cross-compilation, Deassembler/ Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools, The main software utility tool, Debugging tools, Quality assurance and testing of the design, Testing on host machine.

TEXTBOOKS:

i. Embedded Systems Architecture-ByTammyNoergaard, ElsevierPublications, 2013.
ii. Embedded Systems-ByShibu.K.V-TataMcGrawHill Education PrivateLimited, 2013.

REFERENCES:

i. Embedded System Design, FrankVahid, TonyGivargis, John WileyPublications, 2013.
ii. Embedded Systems-LylaB.Das-Pearson Publications, 2013.

COURSE OUTCOMES:

At the end of this course the student can able to:

i. Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
ii. Analyse the hardware components required for an embedded system and the design approach of an embedded hardware.
iii. Distinguish the various embedded firmware design approaches on embedded environment.
iv. Understand how to integrate hardware and firmware of an embedded system using real time operating system.
v. Understand how to embedded system development and its testing

IV Year I semester	PROFESSIONAL ELECTIVE -3	L	T	P	C
		3	0	0	3

MIXED SIGNAL DESIGN

.

COURSE OBJECTIVES:

i. To study about switched capacitor circuits
ii. To gain knowledge on Phase Locked Loops(PLL)
iii. To design and analyze Data Converter Fundamentals
iv. To get an exposure to Nyquist Rate A/D Converters
v. Students will get an understanding about Oversampling Converters

UNIT-I

SWITCHED CAPACITOR CIRCUITS: Introduction to Switched Capacitor circuits-basic building blocks, Operation and Analysis, Signal flow graph analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters, Charge Injection.

UNIT-II

PHASED LOCK LOOP(PLL): BasicPLLtopology,DynamicsofsimplePLL,ChargepumpPLLs-Lockacquisition,Phase/FrequencydetectorandchargepumpBasicchargepumpPLL,Non-idealeffectsinPLLs- PFD/CP non- idealities, Jitter in PLLs, Delay locked loops, applications, Voltage Controlled Oscillator.

UNIT-III

DATA CONVERTER FUNDAMENTALS: DC and dynamic specifications, Quantization noise, Nyquist Rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, glitches, Hybrid converters.

UNIT-IV

NYQUIST RATE A/D CONVERTERS: Successive approximation converters, Flash converter, Two-step A/D converters,InterpolatingA/Dconverters,FoldingA/Dconverters,PipelinedA/Dconverters, Time- interleaved converters, Cyclic A/D converters.

UNIT-V

OVERSAMPLING CONVERTERS: Noise shaping modulators, Advantages of over sampling, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multi bit quantizes, Delta sigma D/A, Band pass oversampling A/D converter.

TEXT BOOKS:

i. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg Oxford University Press, International Second Edition/Indian Edition, 2010.
ii. Design of Analog CMOS Integrated Circuits - Behzad Razavi, TMH Edition, 2002.

REFERENCE BOOKS:

i. Analog Integrated Circuit Design - David A. Johns, Ken Martin, Wiley Student Edition, 2013.
ii. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

COURSE OUTCOMES:

i. Fully appreciate about the concepts of switched capacitor circuits
ii. Grasp the significance of Phased Locked Loop (PLL).
iii. Have the ability to explain the Data Converter Fundamentals.
iv. Have the ability to understand the Nyquist Rate A/D Converters
v. Grasp the significance of Oversampling Converters

IV Year I semester	PROFESSIONAL ELECTIVE -3	L	T	P	C
		3	0	0	3

BIO-MEDICAL ELECTRONICS

COURSE OBJECTIVES:

The main objectives of the course are:

i. Explore to the Model biological systems and biomedical potentials.
ii. Explanation on the principles of electrodes , transducers ,Sensors & Bio-Telemetry in bio-instrumentation.
iii. Analysis of ECG, Respiratory and opthomology signals and Measure bio medical signal parameters.
iv. explore to the patient care, monitoring, Theraphic & surgical instruments etc.
v. Analysis of medical imaging system and shock hazards with their prevention mechanisms.

UNIT-I

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION AND BIOELECTRIC POTENTIALS: Introduction about Biomedical instrumentation .Man Instrumentation System, Components of the Man-Instrument System,Physiological System of the Body, Problems Encountered in Measuring a Living System,Bioelectric Potentials, Resting and Action Potentials,Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG.

UNIT-II:

ELECTRODES, TRANSDUCERS , SENSORS & BIO-TELEMETRY: Introduction, Electrode Theory,Bio -potential Electrodes, Examples of Electrodes, Basic Transducer Principles, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications,Biochemical Transducers, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.Introduction to Biotelemetry, The Components of Biotelemetry System, Implantable Units,Applications of telemetry devices.

UNIT-III:

CARDIOVASCULAR , RESPIRATORY&OPTHOMOLOGY SYSTEM MEASUREMENTS:

Anatomy of heart, The Physiology Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output,Measurement of Heart Sound, Plethysmography. Anatomy of lungs ,The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.Anatomy of Vision,Ophthalmology Instruments,Electrophysiological Tests(ERG,EOG) , Ophthalmoscope, Tonometer for Eye Pressure

UNIT-IV:

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repairability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use. BiopotentialAmplifiers, Monitors,Recorders.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids.Myoelectric Arm, Laparoscope,Measurement Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

UNIT-V:

MEDICAL IMAGING SYSTEMS : Radiography, MRI, Computed Tomography, Ultrasonography, Principles of Ultrasonic ,Measurements, Ultrasonic and its applications in medicine.

SHOCK HAZARDS AND PREVENTION:Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution.

TEXT BOOKS:

i. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey,Rakesh Kumar, Katson Books.
ii. "Bio-Medical Instrumentation", Cromewell ,Wiebell, Pfeiffer

REFERENCES:

i. "Introduction to Bio-Medical Equipment Technology", 4th Edition,Joseph J. Carr, John M. Brown,
Pearson Publications.
ii. "Hand Book of Bio-Medical Instrumentation", Khandapur.McGrawHill

COURSE OUTCOMES:

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

i. Model biological systems and biomedical potentials
ii. Comprehend the principles of electrodes ,transducers ,Sensors & Bio-Telemetryin bio-instrumentation.
iii. Analyze the ECG,Respiratory and opthomology signals and Measure bio medical signal parameters.
iv. Study about patient care ,monitoring , Theraphic & surgical instruments etc.
v. Analyze the medical imaging system and shock hazards with their prevention mechanisms.

IV Year I semester	PROFESSIONAL ELECTIVE -4	L	T	P	C
		3	0	0	3

SATELLITE COMMUNICATIONS

Course OBJECTIVES

The student will be introducedto:

i. Understand the basic concepts, applications, frequencies used and types of satellite communications.
ii. Understand the various satellite subsystems and its functionality.
iii. Understand the concepts of satellite link design and calculation of C/N ratio.
iv. Understand the concepts of multiple access and various types of multiple access techniques in satellite systems.
v. Understand the concepts of satellite navigation, architecture and applications of GPS.

UNIT I

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, 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 antenna Equipment reliability and Space qualification.

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 example.

UNIT III

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, 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 and reception.

UNIT IV

EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs.

UNIT V

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

i. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
ii. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES:

i. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
ii. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
iii. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

Outcomes:

At the end of this course the student can able to:

i. Ability to know the knowledge of satellite communication and orbital importance.
ii. To know the importance of different kinds of subsystems and satellite link design.
iii. Ability to know the effect of atmospheric effect on satellite communication
iv. Able to calculate the multiple access technique like TDMA, CDMA, FDMA and DAMA.
v. Able to demonstrate the impact of GPS, Navigation for tracking and launching the satellite.

IV Year I semester	PROFESSIONAL ELECTIVE -4	L	T	P	C
		3	0	0	3

ERROR CORRECTING CODES

Course Objectives:

1. To acquire the knowledge in measurement of information and errors.
2. To study the generation of various code methods used in communications.
3. To study the various application of codes.

Unit-I

Coding for Reliable Digital Transmission and storage:

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes:

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

Unit-II

Cyclic Codes:

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

Unit-III

Convolutional Codes:

Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

Unit-IV

Turbo Codes:

LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

Unit-V

Space-Time Codes:

Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing: General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J. Costello, Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

REFERENCE BOOKS:

1. Error Correcting Coding Theory-Man Young Rhee-1989, McGraw – Hill Publishing, 19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.

Course Outcomes:

1. Able to transmit and store reliable data and detect errors in data through coding.
2. Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes.

IV Year I semester	PROFESSIONAL ELECTIVE -4	L	T	P	C
		3	0	0	3

WAVELETS AND MULTIRATE SYSTEMS

Course Objectives:

i. To study the origin and history of wavelets including the Fourier analysis
ii. To study CWT and its kernel
iii. To learn the basics of multirate systems and its applications
iv. To study QMF banks and perfect reconstruction concepts
v. To study and implement Para-unitary Perfect Reconstruction (PR) Filter Banks

UNIT I:

Introduction to wavelets: The origins of wavelets, wavelets and other reality transforms, managing Heisenberg's uncertainty, history of wavelet from morlet Dabunchies via mallet, Wavelets in the future

Fourier series and Geometry:

Vector space, Functions and Function spaces, Complex Fourier series, Orthogonality of Complex exponential bases

UNIT-II:

Continuous wavelet and Short time Fourier Transform: Wavelet transform –First level introduction, Mathematical prelimininaries, Properties of wavelets uses Continues wavelet transform, Continuous Vs Discrete wavelet transforms

UNTI-III:

Fundamentals of Multirate Systems: Introduction, Basic Multirate operations, Interconnections of Building Blocks, The Poly phages representation, Multi stage implementations, Some applications of Multirate systems, Special filters and filter banks, Multigrid methods

UNTI-IV:

Multirate Filter Banks: Introduction, Error created in the QMF bank, A simple alias –free QMF bank, Power symmetric QMF bank, M-Channel filter banks, Poly phase representation, Perfect reconstruction (PR) systems, Alias free filter banks, Tree structured filter banks, Transmultiplexers

UNIT-V:

Paraunitary Perfect Reconstruction (PR) Filter Banks: Introduction, Loss less transfer matrices,Filter bank properties induced by paraunitaries,Two channel Paraunitary QMF Lattice,M-Channel FIR para-unitary filter banks,Transfer coding and the 'LOT'

Linear phase perfect reconstruction QMF Banks: Introduction, Necessary conditions, Lattice structures for linear phase FIR PR QMF banks, Formal synthesis of for Linear phase FIR PR QMF banks

Text Books:

i. P.P.Vidyanathan , "Multi-rate systems and filter banks", Pearson publications,
ii. Soman Ramachandran Reshmi," Insight into Wavelets", Third edition, PHI, March, 2010.

Reference Book:

i. S.Mallet , A wavelet tour of signal processing, 3rd Edition,Elsevier publishers, 2012

Course Outcomes:

After the course, the student able to

i. Operate on wavelets and work on Fourier domain
ii. Work on CWT by learning its properties. Also, will be able to discriminate CWT and DWT
iii. Analyze multirate systems and perform basic applications on Multirate systems
iv. Operate on QMF banks and its different forms
v. Implement Para-unitary Perfect Reconstruction (PR) Filter Banks

IV Year - I Semester

L	T	P	C
0	0	3	1.5

Image and Video Processing Lab

List of experiments

1) Perform The Fundamental Operations On The Given Image Using Mat Lab
2) Perform The Point Processing And Pixel Operations On The Given Image
3) Perform Arithmetic And Logical Operations On The Given Digital Image
4) Generate The Histogram Of The Given Digital Image And Also Generate The Histogram Equalized Image And Histogram Specified Image
5) Perform The Geometric Transformations On Given Image
6) Restore The Given Image Using Different Image Restoration Filters
7) Perform The Spatial Filtering Operation On The Given Image Using Different Spatial Domain Filters
8) Perform Lpf And Hpf In Frequency Domain Of The Given Image
9) Perform Different Morphological Operations Of The Given Image
10) Implement Wavelet Transform Decomposition On The Given Image And Show Different Sub Bands
11) Extract The Key Frame In From The Given Video Stream
12) Convert Video Into Frames

Additional Experiments

1) Perform The Following Transformations Dct, Svd, Haar, Walsh, Hadamd On The Given Image And Calculate Psnr Mse And Ssim
2) Perform Image Compression Techniques On Given Image

IV Year - I Semester

L	T	P	C
0	0	3	3

Project- Part-I

IV Year II semester	PROFESSIONAL ELECTIVE -5	L	T	P	C
		3	0	0	3

ANALOG IC DESIGN

COURSE OBJECTIVES:

The student will be introduced to

i. The student will be able to understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
ii. In this course, students can study CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
iii. Another main object of this course is to motivate the graduate students to design and to develop the Analog CMOS Circuits for different Analog operations.
iv. To learn about cmos op-amps
v. The concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

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, Cascode current Mirror and Wilson Current Mirror.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode 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, Cascode 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.

Oscillators: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.

TEXT BOOKS:

i. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
ii. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg,Oxford University Press, International Second Edition/Indian Edition, 2010.

References:

i. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
ii. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn, 2013.

COURSE OUTCOMES:

After going through this course, the student will be able to

i. Understand the concepts of MOS Devices and Modeling.
ii. Design and analyze any Analog Circuits in real time applications.
iii. Extend the Analog Circuit Design to Different Applications in Real Time.
iv. Analysis different types of op-amps using CMOS.
v. Understand of Open-Loop Comparators and Different Types of Oscillators.

IV Year II semester **PROFESSIONAL ELECTIVE -5**

L	T	P	C
3	0	0	3

CMOS DESIGN

COURSE OBJECTIVES:

i. To design and analyze MOS inverter and its characteristics.
ii. To understand the static and dynamic CMOS logic circuits
iii. To gain knowledge on designing of combinational and sequential logic circuits.
iv. To get an exposure on SRAM and DRAM design.
v. To design & distinguish between CAM, EPROMs, E2PROM and FRAM

UNIT-I

MOS DESIGN: MOS Inverters Static characteristics: Resistive load inverter, Inverters with n-type MOSFET load, CMOS inverter. MOS Inverters Switching characteristics: Delay time definitions, Calculations of Delay Times.

UNIT-II

COMBINATIONAL MOS LOGIC CIRCUITS: MOS logic circuits with NMOS loads, Primitive CMOS logic gates–NOR &NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOSgates, AOIand OIAgates, CMOSfull adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III

SEQUENTIAL & DYNAMIC LOGIC CIRCUITS: Behavior of bistable elements, SR Latch, Clocked latch and flip-flop circuits, CMOS D latch and edge triggered flip-flop. Basic principle of Pass transistor circuits, Voltage Boot strapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOScircuits.

UNIT-IV

SEQMICONDUCTOR MEMORY DESIGN: Introduction, MOS Decoders, Static RAM Cell Design, SRAM Column I/O Circuitry, Memory Architecture.

UNIT-V

ADDITIONAL MEMORY DESIGN: Introduction, Content-Addressable Memories (CAMs), Dynamic Read-Write Memories, Read-Only Memories, EPROMs, E2PROMs, Flash Memory, FRAMs.

TEXT BOOKS:

i. CMOS Digital Integrated Circuits Analysis and Design,Sung-Mo Kang, TMH, 3rd Ed., 2011.
ii. Analysis and Design of Digital Integrated Circuits, Third Edition, David A. Hodges, Horace G. Jackson, and Resve A. Saleh, McGraw-Hill, 2004.

REFERENCE BOOKS:

i. Digital Integrated Circuit Design, KenMartin,Oxford University Press, 2011.
ii. Digital Integrated Circuits, A Design Perspective, Jan M.Rabaey, AnanthaChandrakasan, Borivoje Nikolic, 2ndEd, PHI.

COURSE OUTCOMES:

i. Grasp the significance of MOS Inverter and its characteristics.
ii. Have the ability to understand the static and dynamic CMOS logic Circuits.
iii. Have the ability to explain and analyze the combinational and sequential logic Circuits.
iv. Grasp the significance of SRAM and DRAM Design
v. Distinguish various additional memories like CAM, EPROMs, E2PROM and FRAM

IV Year II semester	PROFESSIONAL ELECTIVE -5	L	T	P	C
		3	0	0	3

LOW POWER VLSI DESIGN

COURSE OBJECTIVES:

i. To study different fundamentals ofLow Power VLSIDesign.
ii. To gain knowledge on Low-Power design Approaches,Low-Power design through voltage scaling.
iii. Students will learn Low VoltageLow Power Adders.
iv. To get an exposure onLowVoltageLow Power Multipliers.
v. To understand the Low-Voltage Low-Power Memories.

UNIT-I

FUNDAMENTALS OF LOW POWER VLSI DESIGN: Need forLow Power CircuitDesign, SourcesofPowerDissipation, SwitchingPower Dissipation, ShortCircuitPowerDissipation, LeakagePowerDissipation,GlitchingPower Dissipation, Short Channel Effects –Drain Induced Barrier LoweringandPunchThrough,SurfaceScattering,VelocitySaturation, ImpactIonization,HotElectronEffect.

UNIT-II

LOW-POWER DESIGN APPROACHES LOW-POWER DESIGN THROUGH VOLTAGE SCALING:VTCMOScircuits,MTCMOScircuits,Architectural Level Approach– PipeliningandParallelProcessingApproaches.SwitchedCapacitanceMinimizationApproachesSystemLevelMeasures,CircuitLevelMeasures,MasklevelMeasures.

UNIT-III

LOW-VOLTAGE LOW-POWER ADDERS: Introduction,StandardAdderCells, CMOSAdder'sArchitectures–RippleCarryAdders,CarryLook-Ahead Adders,CarrySelectAdders,CarrySaveAdders,Low-VoltageLow- PowerDesignTechniques– TrendsofTechnologyandPowerSupplyVoltage,Low-VoltageLow-PowerLogicStyles.

UNIT-IV

LOW-VOLTAGE LOW-POWER MULTIPLIERS:
Introduction,OverviewofMultiplication,TypesofMultiplierArchitectures,BraunMultiplier, Baugh-WoolleyMultiplier,BoothMultiplier,IntroductiontoWallaceTreeMultiplier.

UNIT-V

LOW-VOLTAGE LOW-POWER MEMORIES: BasicsofROM,Low-PowerROMTechnology, Future Trend andDevelopmentof ROMs, Basics of SRAM,MemoryCell,PrechargeandEqualizationCircuit,Low-Power SRAM Technologies,BasicsofDRAM,Self-RefreshCircuit,FutureTrendandDevelopmentofDRAM.

TEXT BOOKS:

i. CMOSDigitalIntegratedCircuits–AnalysisandDesign–Sung-MoKang,YusufLeblebici,TMH,2011.
ii. Low-Voltage,Low-PowerVLSISubsystems–Kiat – SengYeo,KaushikRoy,TMHProfessionalEngineering.

REFERENCES:

i. LowPowerCMOSDesign–AnanthaChandrakasan,IEEEPress/WileyInternational,1998.
ii. LowPowerCMOSVLSICircuitDesign–KaushikRoy,SharatC.Prasad, JohnWiley&Sons,2000.

COURSE OUTCOMES:

i. Fully appreciate about concepts of different Fundamentals OfLow Power VLSI Design.
ii. Grasp the significance of Low-Power Design Approaches,Low-Power Design through voltage scaling.
iii. Have the ability to explain Low VoltageLow Power Adders.
iv. Gain the knowledge on the Low VoltageLow Power Multipliers.
v. Grasp the significance of theLow-Voltage Low-Power Memories.

IV Year II semester **OPEN ELECTIVE -2**

L	T	P	C
3	0	0	3

Machine Learning algorithms (ANN's)

Course objectives:

The main objective of this course is for the students to achieve basic knowledge of artificial intelligence, a deepened technical understanding of machine learning research and theories, as well as practical experience of the use and design of machine learning and data mining algorithms for applications and experiments. The course has a strong focus towards applied IT. The student not only learns how to critically review and compare different algorithms and methods, but how to plan, design, and implement learning components and applications and how to conduct machine learning experiments.

UNIT I: Introduction:

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning. Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT II: Linear Regression & Logistic Regression:

Predicting numeric values: regression - Finding the best fit lines with linear regression, Locally weighted linear regression, Shrinking Coefficients, The bias / Variance tradeoff.

Logistic Regression: Classification with logistic regression and the sigmoid function, Using optimization to find the best regression coefficients.

UNIT III: Artificial Neural Networks:

Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks

Evaluation Hypotheses:

Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT IV: Support vector machines & Dimensionality Reduction techniques:
Separating data with the maximum margin, finding the maximum margin, efficient optimization with SMO algorithm, speeding up optimization with full platt SMO, Using Kernels for more Complex data.
Dimensionality Reduction techniques: Principal Component analysis, Example.

UNIT V:
Instance-Based Learning- Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.
Genetic Algorithms: Representing Hypotheses, Genetic Operators, Fitness Function and Selection, Illustrative Example.

TEXT BOOKS:
1. Machine Learning ,Tom M. Mitchell, MGH
2. Machine Learning in Action, Peter Harington, 2012, Cengage.`
REFERENCE BOOKS:
1. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004

Course outcomes:
i. The student will be able evaluate and compare the performance or, other qualities, of algorithms for typical learning problems.
ii. The student will be able to design a supervised or unsupervised learning system.

IV Year II semester **OPEN ELECTIVE -2** **L T P C**
3 0 0 3

Optimization Techniques

COURSE OBJECTIVES:

The students will acquire the knowledge:

i. To understand classification of optimization problem and apply classical optimization Techniques.
ii. To apply unconstrained optimization techniques using various methods.
iii. To understand the characteristics and approaches of constrained optimization techniques.
iv. To obtain optimized solutions using constrained and unconstrained geometric Programming.
v. To understand integer programming methods

UNIT I

INTRODUCTION TO OPTIMIZATION: Engineering applications of optimization- statement of an optimization problem- classification of optimization problem- optimization techniques.

CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization- multivariable optimization with equality constraints- multivariable optimization with inequality constraints.

UNIT-II

UNCONSTRAINED OPTIMIZATION TECHNIQUES: pattern search method- rosenbrock's method of rotating coordinates- the simplex method- descent methods- gradient of function- steepest descent method.

UNIT-III

CONSTRAINED OPTIMIZATION TECHNIQUES: characteristics of a constrained problem- methods of feasible directions - basic approach in the penalty function method- interior penalty function method- convex programming problem- exterior penalty function method.

UNIT-IV

GEOMETRIC PROGRAMMING (G.P): Solution of an unconstrained geometric programming, differential calculus method and arithmetic method. primal dual relationship and sufficiency conditions.

Solution of a constrained geometric programming problem (G.P.P). Complimentary geometric programming (C.G.P).

UNIT-V

INTEGER PROGRAMMING (I.P): Graphical representation. Gomory's cutting plane method. Bala's algorithm for zero-one programming problem. Integer non linear programming.

TEXT BOOK:

1. Optimization Theory and Applications, by S.S.Rao, Wiley Eastern Limited, New Delhi.

REFERENCES:

1. Engineering Optimization By Kalyanmanai Deb, Prentice Hall of India, New Delhi.
2. Optimization Techniques-Theory and applications/ C.mohna &kusum Deep/New Age International
3. Operations Research by S.D.Sharma.

Course Out comes:

Upon successful completion of this course student should be able to:

i. Understand classification of optimization problem and apply classical optimization techniques (BL-2) .
ii. Apply unconstrained optimization techniques using various methods (BL-3).
iii. Understand the characteristics and approaches of constrained optimization techniques (BL-2).
iv. Identify optimized solutions using constrained and unconstrained geometric programming (BL-3).
v. Understand integer programming methods (BL-2)

IV Year II semester **OPEN ELECTIVE -2** **L T P C**
3 0 0 3

STASTICAL SIGNAL PROCESSING

COURSE OBJECTIVES:

i. To study about different signal models
ii. Know about spectral estimation
iii. To study about different spectral parameters
iv. To study abut spectrum estimation
v. Know about wiener filtering

UNIT- I

Signal models and characterization: Types and properties of statistical models for signals and how they relate to signal processing, Common second-order methods of characterizing signals including autocorrelation, partial correlation, cross-correlation, power spectral density and cross-power spectral density.

UNIT- II

Spectral estimation: Nonparametric methods for estimation of power spectral density, autocorreleation, cross-correlation,transfer functions, and coherence form finite signal samples.

UNIT- III

Review of signal processing: A review on random processes, A review on filtering random processes, Examples.

Statistical parameter estimation: Maximum likehood estimation, maximum a posterior stimation, Cramer-Rao bound.

UNIT- IV

Eigen structure based frequency estimation: Pisarenko, MUSIC, ESPRIT their application sensor array direction finding.

Spectrum estimation: Moving average (MA), Auto Regressive (AR), Auto Regressive Moving Average (ARMA), Various non-parametirc approaches.

UNIT -V

Wiener filtering: The finite impulse case, causal and non-causal infinite impulse responses cases, Least mean squares adaptation, recursive least squares adaptation, Kalman filtering.

TEXT BOOKS:

1. Steven M.Kay, fundamentals of statistical signal processing: estimation Theory,Pretice-Hall,1993.

2. Monsoon H. Hayes, Stastical digital signal processing and modeling, USA, Wiley,1996.

REFERENCE BOOKS:

1. Dimitris G.Manolakis, Vinay K. Ingle, and Stephen M. Kogon, Statistical and adaptive signal processing, Artech House, Inc,2005, ISBN 1580536107

Course outcomes:

The student will be able

i. Understand about different signal models
ii. Analyze spectral estimation
iii. Define different spectral parameters
iv. Understand about spectrum estimation
v. Know about wiener filtering

IV Year II semester

L	T	P	C
0	0	9	9

Project –Part-II