### ANNA UNIVERSITY, CHENNAI
NON-AUTONOMOUS AFFILIATED COLLEGES
REGULATIONS 2023
B. E. ELECTRONICS AND COMMUNICATION ENGINEERING (PART-TIME)
CURRICULUM FOR SEMESTERS I TO VIII

#### SEMESTER I

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### ELECTIVE – MANAGEMENT COURSES

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COURSE OBJECTIVES:
- To develop the use of matrix algebra techniques that are needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES 9 + 3

UNIT II DIFFERENTIAL CALCULUS 9 + 3

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9 + 3

UNIT IV INTEGRAL CALCULUS 9 + 3
Definite and Indefinite integrals - Substitution rule - Techniques of Integration : Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications : Hydrostatic force and pressure, moments and centres of mass.

UNIT V MULTIPLE INTEGRALS 9 + 3

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1: Use the matrix algebra methods for solving practical problems.
CO2: Apply differential calculus tools in solving various application problems.
CO3: Able to use differential calculus ideas on several variable functions.
CO4: Apply different methods of integration in solving practical problems.
CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.

**TEXT BOOKS:**
3. James Stewart, "Calculus : Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8 ].

**REFERENCES:**

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1 - low, 2 - medium, 3 - high, '-' - no correlation
COURSE OBJECTIVES:

- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I  MECHANICS

UNIT II  ELECTROMAGNETIC WAVES
The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cellphone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III  OSCILLATIONS, OPTICS AND LASERS

UNIT IV  BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V  APPLIED QUANTUM MECHANICS
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch’s theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL : 45 PERIODS
COURSE OUTCOMES:
After completion of this course, the students should be able to
CO1: Understand the importance of mechanics.
CO2: Express their knowledge in electromagnetic waves.
CO3: Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
CO4: Understand the importance of quantum physics.
CO5: Comprehend and apply quantum mechanical principles towards the formation of energy bands.

TEXT BOOKS:
2. E.M. Purcell and D.J. Morin, Electricity and Magnetism, Cambridge Univ. Press, 2013.

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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1 - low, 2 - medium, 3 - high, '-' - no correlation
COURSE OBJECTIVES:
- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT I  WATER AND ITS TREATMENT
9

UNIT II  NANO CHEMISTRY
9
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III  PHASE RULE AND COMPOSITES
9
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV  FUELS AND COMBUSTION
9
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical
calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. \( \text{CO}_2 \) emission and carbon footprint.

UNIT V ENERGY SOURCES AND STORAGE DEVICES

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; Electric vehicles - working principles; Fuel cells: \( \text{H}_2-\text{O}_2 \) fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

**CO1**: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.

**CO2**: To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.

**CO3**: To apply the knowledge of phase rule and composites for material selection requirements.

**CO4**: To recommend suitable fuels for engineering processes and applications.

**CO5**: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.

TEXT BOOKS:


REFERENCES:

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### PTGE3151 PROBLEM SOLVING AND PYTHON PROGRAMMING

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#### COURSE OBJECTIVES:
- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

#### UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING

#### UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

#### UNIT III CONTROL FLOW, FUNCTIONS, STRINGS
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays; Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.
UNIT IV    LISTS, TUPLES, DICTIONARIES
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V    FILES, MODULES, PACKAGES
Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter’s age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, students will be able to
CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and loops for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

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COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc. - operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter’s age validity, student mark range validation)
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Implement programs in Python using conditionals and loops for solving problems.
CO4: Deploy functions to decompose a Python program.
CO5: Process compound data using Python data structures.
CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

REFERENCES:
5. https://www.python.org/

CO’s-PO’s & PSO’s MAPPING

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1 - low, 2 - medium, 3 - high, '-' - no correlation
COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9 + 3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - $2^2$ factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9 +3
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9 +3

TOTAL: 60 PERIODS
COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:
CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.
CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.
CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
CO4: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
CO5: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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1 - low, 2 - medium, 3 - high, '-' - no correlation
COURSE OBJECTIVES:
- To make the students to understand the basics of crystallography and its importance in studying materials properties.
- To understand the electrical properties of materials including free electron theory, applications of quantum mechanics and magnetic materials.
- To instil knowledge on physics of semiconductors, determination of charge carriers and device applications.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications.
- To inculcate an idea of significance of nano structures, quantum confinement and ensuing nano device applications.

UNIT I CRYSTALLOGRAPHY

UNIT II ELECTRICAL AND MAGNETIC PROPERTIES OF MATERIALS

UNIT III SEMICONDUCTORS AND TRANSPORT PHYSICS

UNIT IV OPTICAL PROPERTIES OF MATERIALS
UNIT V   NANO DEVICES


TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students should be able to
CO1: know basics of crystallography and its importance for varied materials properties
CO2: gain knowledge on the electrical and magnetic properties of materials and their applications
CO3: understand clearly of semiconductor physics and functioning of semiconductor devices
CO4: understand the optical properties of materials and working principles of various optical devices
CO5: appreciate the importance of nanotechnology and nanodevices.

TEXT BOOKS:

REFERENCES:

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1 - low, 2 - medium, 3 - high, '-' - no correlation
COURSE OBJECTIVES:
- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNIT I  C PROGRAMMING FUNDAMENTALS (8+1 SKILL)  9

UNIT II  C PROGRAMMING - ADVANCED FEATURES (8+1 SKILL)  9

UNIT III  LINEAR DATA STRUCTURES (8+1 SKILL)  9

UNIT IV  NON-LINEAR DATA STRUCTURES (8+1 SKILL)  9

UNIT V  SORTING AND SEARCHING TECHNIQUES (8+1 SKILL)  9
Insertion Sort – Quick Sort – Heap Sort – Merge Sort –Linear Search – Binary Search.

TOTAL: 45 PERIODS

SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)  5

COURSE OUTCOMES:
- CO1: Develop C programs for any real world/technical application.
- CO2: Apply advanced features of C in solving problems.
- CO3: Write functions to implement linear and non–linear data structure operations.
- CO4: Suggest and use appropriate linear/non–linear data structure operations for solving a given problem.
- CO5: Appropriately use sort and search algorithms for a given application.
- CO6: Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.
TEXT BOOKS:

REFERENCES:

List of Open Source Software/ Learning website:
https://www.coursera.org/specializations/data-structures-algorithms
https://nptel.ac.in/courses/112107243
https://nptel.ac.in/courses/112105598

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PTGE3451  ENVIRONMENTAL SCIENCES AND SUSTAINABILITY

COURSE OBJECTIVES:
- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization.
UNIT I  ENVIRONMENT AND BIODIVERSITY 6

UNIT II  ENVIRONMENTAL POLLUTION 6

UNIT III  RENEWABLE SOURCES OF ENERGY 6
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV  SUSTAINABILITY AND MANAGEMENT 6
Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V  SUSTAINABILITY PRACTICES 6

TOTAL:30 PERIODS

COURSE OUTCOMES:
CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.
TEXT BOOKS:
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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1 - low, 2 - medium, 3 - high, ‘-’ - no correlation
COURSE OBJECTIVES:
- To develop applications in C
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENTS
1. Practice of C programming using statements, expressions, decision making and iterative statements
2. Practice of C programming using Functions and Arrays
3. Implement C programs using Pointers and Structures
4. Implement C programs using Files
5. Development of real time C applications
6. Array implementation of List ADT
7. Array implementation of Stack and Queue ADTs
8. Linked list implementation of List, Stack and Queue ADTs
9. Applications of List, Stack and Queue ADTs
10. Implementation of Binary Trees and operations of Binary Trees
11. Implementation of Binary Search Trees
12. Implementation of searching techniques
13. Implementation of Sorting algorithms : Insertion Sort, Quick Sort, Merge Sort

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will be able to:
CO1: Use different constructs of C and develop applications
CO2: Write functions to implement linear and non-linear data structure operations
CO3: Suggest and use the appropriate linear / non-linear data structure operations for a given problem
CO4: Apply appropriate hash functions that result in a collision free scenario for data storage and Retrieval
CO5: Implement Sorting and searching algorithms for a given application

CO’s-PO’s & PSO’s MAPPING

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COURSE OBJECTIVES:
- To introduce the basic notions of vector spaces which will then be used to solve related problems.
- To understand the concepts of vector space, linear transformations, inner product spaces and orthogonalization.
- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To provide necessary basics in probability that are relevant in applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.

UNIT - I PROBABILITY AND RANDOM VARIABLES 9 + 3
Axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions - Functions of a random variable.

UNIT - II TWO - DIMENSIONAL RANDOM VARIABLES 9 + 3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT – III RANDOM PROCESSES 9 + 3
Classification – Stationary process – Markov process - Poisson process - Discrete parameter Markov chain – Chapman Kolmogorov equations (Statement only) - Limiting distributions.

UNIT - IV VECTOR SPACES 9 + 3
Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT - V LINEAR TRANSFORMATION AND INNER PRODUCT SPACES 9 + 3

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course, students will be able to:  
CO1: Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.  
CO2: Demonstrate accurate and efficient use of advanced algebraic techniques.  
CO3: Apply the concept of random processes in engineering disciplines.
CO4: Understand the fundamental concepts of probability with a thorough knowledge of standard distributions that can describe certain real-life phenomenon.

CO5: Understand the basic concepts of one and two dimensional random variables and apply them to model engineering problems.

TEXTBOOKS:

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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PTEC3251 CIRCUIT ANALYSIS

COURSE OBJECTIVES:
- To learn the basic concepts and behaviour of DC and AC circuits.
- To understand various methods of circuit/ network analysis using network theorems.
● To understand the transient and steady state response of the circuits subjected to DC excitations and AC with sinusoidal excitations.
● To learn the concept of coupling in circuits and topologies.

UNIT I  DC CIRCUIT ANALYSIS
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, The single Node – Pair Circuit, series and Parallel Connected Independent Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.

UNIT II  NETWORK THEOREM AND DUALITY
Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion. Duals, Dual circuits. Analysis using dependent current sources and voltage sources

UNIT III  SINUSOIDAL STEADY STATE ANALYSIS

UNIT IV  TRANSIENTS AND RESONANCE IN RLC CIRCUITS

UNIT V  COUPLED CIRCUITS AND TOPOLOGY
Magnetically Coupled Circuits, mutual Inductance, the Linear Transformer, the Ideal Transformer, An introduction to Network Topology, Trees and General Nodal analysis, Links and Loop analysis.

SUGGESTED ACTIVITIES:
● Practice solving variety of problems

COURSE OUTCOMES
On successful completion of this course, the student will be able to
- CO1: Apply the basic concepts of circuit analysis such as Kirchoff's laws, mesh current and node voltage method for analysis of DC and AC circuits.
- CO2: Apply suitable network theorems and analyze AC and DC circuits
- CO3: Analyze steady state response of any R, L and C circuits
- CO4: Analyze the transient response for any RC, RL and RLC circuits and frequency response of parallel and series resonance circuits.
- CO5: Analyze the coupled circuits and network topologies

TOTAL: 60 PERIODS
TEXT BOOKS:

REFERENCES:

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PTEC3352 DIGITAL SYSTEMS DESIGN L T P C
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COURSE OBJECTIVES:
- To present the fundamentals of digital circuits and simplification methods
- To practice the design of various combinational digital circuits using logic gates
- To bring out the analysis and design procedures for synchronous and asynchronous Sequential circuits
- To learn integrated circuit families.
- To introduce semiconductor memories and related technology

UNIT I BASIC CONCEPTS
Review of number systems-representation-conversions, Review of Boolean algebra-theorems, sum of product and product of sum simplification, canonical forms min term and max term, Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Implementation of Boolean expressions using universal gates, Tabulation methods.
UNIT II  COMBINATIONAL LOGIC CIRCUITS  9
Problem formulation and design of combinational circuits - Code-Converters, Half and Full
Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator,
Decoder, Encoder, Priority Encoder, Mux/Demux, Case study: Digital trans-receiver / 8 bit
Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder

UNIT III  SYNCHRONOUS SEQUENTIAL CIRCUITS  9
Latches, Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis and design of
clocked sequential circuits – Design - Moore/Mealy models, state minimization, state
assignment, lock - out condition circuit implementation - Counters, Ripple Counters, Ring
Counters, Shift registers, Universal Shift Register. Model Development: Designing of rolling
display/real time clock

UNIT IV  ASYNCHRONOUS SEQUENTIAL CIRCUITS  9
Stable and Unstable states, output specifications, cycles and races, state reduction, race free
assignments, Hazards, Essential Hazards, Fundamental and Pulse mode sequential circuits,
Design of Hazard free circuits.

UNIT V  LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES  9
Logic families - Propagation Delay, Fan - In and Fan - Out - Noise Margin - RTL ,TTL,ECL,
CMOS - Comparison of Logic families - Implementation of combinational logic/sequential
logic design using standard ICs, PROM, PLA and PAL, basic memory, static
ROM,PROM,EPROM,EAPROM,EEPROM.

PRACTICAL EXERCISES :  
1. Design of adders and subtractors & code converters.
2. Design of Multiplexers & Demultiplexers.
3. Design of Encoders and Decoders.
4. Design of Magnitude Comparators
5. Design and implementation of counters using flip-flops
6. Design and implementation of shift registers.

COURSE OUTCOMES :  
At the end of the course the students will be able to

CO1: Use Boolean algebra and simplification procedures relevant to digital logic.
CO2: Design various combinational digital circuits using logic gates.
CO3: Analyse and design synchronous sequential circuits.
CO4: Analyse and design asynchronous sequential circuits.
CO5: Build logic gates and use programmable devices

TEXTBOOKS :
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PTEC3271 CIRCUIT ANALYSIS LABORATORY

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COURSE OBJECTIVES:
- To gain hands-on experience in Thevenin & Norton theorem, KVL & KCL, and Superposition Theorems.
- To understand the working of RL,RC and RLC circuits.

List of Experiments:
1. Verifications of KVL & KCL.
2. Verifications of Thevenin & Norton theorem.
3. Verification of Superposition Theorem.
4. Verification of maximum power transfer Theorem.
5. Determination of Resonance Frequency of Series & Parallel RLC Circuits.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student will be able to
- Design RL and RC circuits.

TEXT BOOKS

REFERENCES

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PTEC3351 CONTROL SYSTEMS

COURSE OBJECTIVES:
- To introduce the components and their representation of control systems
- To learn various methods for analyzing the time response, frequency response and stability of the systems.
- To learn the various approach for the state variable analysis.

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION
Control System: Terminology and Basic Structure - Feed forward and Feedback control theory - Electrical and Mechanical Transfer Function Models - Block diagram Models - Signal flow graphs models - DC and AC servo Systems - Synchronous - Multivariable control system

UNIT II TIME RESPONSE ANALYSIS
Transient response - steady state response - Measures of performance of the standard first order and second order system - effect on an additional zero and an additional pole - steady error constant and system - type number - PID control - Analytical design for PD, PI, PID control systems
UNIT III  FREQUENCY RESPONSE AND SYSTEM ANALYSIS
Closed loop frequency response-Performance specification in frequency domain-Frequency response of standard second order system-Bode Plot-Polar Plot-Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

UNIT IV  CONCEPTS OF STABILITY ANALYSIS

UNIT V  CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS
State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations-State variable analysis of digital control system-Digital control design using state feedback.

TOTAL:45 PERIODS

COURSE OUTCOMES :
Upon successful completion of the course the student will be able to
CO1: Compute the transfer function of different physical systems.
CO2: Analyse the time domain specification and calculate the steady state error.
CO3: Illustrate the frequency response characteristics of open loop and closed loop system response.
CO4: Analyse the stability using Routh and root locus techniques.
CO5: Illustrate the state space model of a physical system and discuss the concepts of sampled data control system.

TEXT BOOK:

REFERENCE:

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PTEC3452              ELECTROMAGNETIC FIELDS              L  T  P  C
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COURSE OBJECTIVES:
● To impart knowledge on the basics of static electric field and the associated laws
● To impart knowledge on the basics of static magnetic field and the associated laws
● To give insight into coupling between electric and magnetic fields through Faraday’s law, displacement current and Maxwell’s equations
● To gain the behaviour of the propagation of EM waves
● To study the significance of Time varying fields.

UNIT I  INTRODUCTION
Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke’s theorem, Null identities, Helmholtz’s theorem, Verify theorems for different path, surface and volume.

UNIT II  ELECTROSTATICS
Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Electrostatics boundary value problems, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law.

UNIT III  MAGNETOSTATICS
Lorentz force equation, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Calculation of magnetic field intensity for various current distributions Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques.

UNIT IV  TIME-VARYING FIELDS AND MAXWELL's EQUATIONS

UNIT V  PLANE ELECTROMAGNETIC WAVES
Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary.
COURSE OUTCOMES:
At the end of the course the students will be able to

CO1: Relate the fundamentals of vector, coordinate system to electromagnetic concepts
CO2: Analyze the characteristics of Electrostatic field
CO3: Interpret the concepts of Electric field in material space and solve the boundary conditions
CO4: Explain the concepts and characteristics of Magneto Static field in material space and solve boundary conditions.
CO5: Determine the significance of time varying fields

TOTAL: 45 PERIODS

TEXT BOOKS

REFERENCES

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PTEC3353 ELECTRONIC DEVICES AND CIRCUITS  L T P C 3 0 0 3

COURSE OBJECTIVES:

- To give a comprehensive exposure to all types of devices and circuits constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- To analyze the frequency response of small signal amplifiers
- To design and analyze single stage and multistage amplifier circuits
- To study about feedback amplifiers and oscillators principles
To understand the analysis and design of multi vibrators

UNIT I  SEMICONDUCTOR DEVICES
PN junction diode, Zener diode, BJT, MOSFET, UJT –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator

UNIT II  AMPLIFIERS
Load line, operating point, biasing methods for BJT and MOSFET, BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS, CG and Source follower – Gain and frequency response- High frequency analysis.

UNIT III  MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER

UNIT IV  FEEDBACK AMPLIFIERS AND OSCILLATORS

UNIT V  POWER AMPLIFIERS AND DC/DC CONVERTERS
Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect-Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design.

TOTAL: 45 PERIODS

COURSE OUTCOMES :
At the end of the course the students will be able to
CO1: Explain the structure and working operation of basic electronic devices.
CO2: Design and analyze amplifiers.
CO3: Analyze frequency response of BJT and MOSFET amplifiers
CO4: Design and analyze feedback amplifiers and oscillator principles.
CO5: Design and analyze power amplifiers and supply circuits

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PTEC3354 SIGNALS AND SYSTEMS L T P C
3 1 0 4

COURSE OBJECTIVES:
- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 6+6

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 6+6
Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and Properties

UNIT III LINEAR TIME IN Variant CONTINUOUS TIME SYSTEMS 6+6

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 6+6
Baseband signal Sampling–Fourier Transform of discrete time signals (DTFT)– Properties of DTFT - Z Transform & Properties
UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 6+6


TOTAL: 30+30 PERIODS

COURSE OUTCOMES:
At the end of the course, the student will be able to:
CO1:determine if a given system is linear/causal/stable
CO2: determine the frequency components present in a deterministic signal
CO3:characterize continuous LTI systems in the time domain and frequency domain
CO4:characterize discrete LTI systems in the time domain and frequency domain
CO5:compute the output of an LTI system in the time and frequency domains

TEXT BOOKS:

REFERENCES :

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PTEC3361 ELECTRONIC DEVICES AND CIRCUITS LABORATORY L T P C
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COURSE OBJECTIVES
- To learn the characteristics of PN Junction diode and Zener diode.
- To understand the operation of rectifiers and filters.
- To study the characteristics of amplifier.
LIST OF EXPERIMENTS
2. Full Wave Rectifier with Filters.
3. Design of Zener diode Regulator.
5. MOSFET Drain current and Transfer Characteristics.
6. Frequency response of CE and CS amplifiers.
7. Frequency response of CB and CC amplifiers.
8. Frequency response of Cascode Amplifier
9. CMRR measurement of Differential Amplifier

COURSE OUTCOMES
At the end of the laboratory course, the student will be able to understand the

CO1: Characteristics of PN Junction Diode and Zener diode.
CO2: Design and Testing of BJT and MOSFET amplifiers.
CO3: Operation of power amplifiers.

REFERENCE:
XYZ of Oscilloscope – Application note: Tektronix USA.

TOTAL: 45 PERIODS

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PTEC3492 DIGITAL SIGNAL PROCESSING L T P C
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COURSE OBJECTIVES:
- To learn discrete fourier transform, properties of DFT and its application to linear filtering
- To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- To understand the effects of finite precision representation on digital filters
- To understand the fundamental concepts of multi rate signal processing and its applications
- To introduce the concepts of adaptive filters and its application to communication engineering
# UNIT I  DISCRETE FOURIER TRANSFORM


# UNIT II  INFINITE IMPULSE RESPONSE FILTERS


# UNIT III  FINITE IMPULSE RESPONSE FILTERS

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations.

# UNIT IV  FINITE WORD LENGTH EFFECTS

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

# UNIT V  DSP APPLICATIONS

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization-DSP Architecture-Fixed and Floating point architecture principles

## COURSE OUTCOMES:

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

- **CO1**: Apply DFT for the analysis of digital signals and systems
- **CO2**: Design IIR and FIR filters
- **CO3**: Characterize the effects of finite precision representation on digital filters
- **CO4**: Design multirate filters
- **CO5**: Apply adaptive filters appropriately in communication systems

**TOTAL: 45 PERIODS**

## TEXT BOOKS:


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PTEC3451 LINEAR INTEGRATED CIRCUITS

COURSE OBJECTIVES:
- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages - and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – MOSFET Operational Amplifiers – LF155 and TL082.
UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL
Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICs
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto- couplers and fibre optic IC

COURSE OUTCOMES:
At the end of the course the students will be able to

CO1 : Design linear and nonlinear applications of OP – AMPS
CO2 : Design applications using analog multiplier and PLL
CO3 : Design ADC and DAC using OP – AMPS
CO4 : Generate waveforms using OP – AMP Circuits
CO5 : Analyze special function ICs

TOTAL:45 PERIODS

TEXT BOOK
REFERENCES

CO’s-PO’s & PSO’s MAPPING

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PTEC3551 TRANSMISSION LINES AND RF SYSTEMS

COURSE OBJECTIVES:
- To introduce the various types of transmission lines and its characteristics
- To understand high frequency line, power and impedance measurements
- To impart technical knowledge in impedance matching using Smith Chart.
- To introduce passive filters and basic knowledge of active RF components
- To learn the concepts of a RF system transceiver design.

UNIT I TRANSMISSION LINE THEORY
General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion less line - Loading and different methods of loading - Line not terminated in Z0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES
Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINE
Impedance matching: Quarter wave transformer, One Eighth wave line, Half wave line - Impedance matching by stubs - Single stub and double stub matching - Smith chart – Application of Smith chart, Solutions of problems using Smith chart - Single and double stub matching using Smith chart.
UNIT IV  
WAVEGUIDES  
Waves between parallel planes of perfect conductors- Transverse Electric waves and Transverse Magnetic waves, Characteristics of TE and TM waves, Transverse Electromagnetic waves, TM and TE waves in Rectangular waveguides, TM and TE waves in Circular waveguides.

UNIT V  
RF SYSTEM DESIGN CONCEPTS  
Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors, Fundamentals of MMIC, Basic concepts of RF design: Filters, couplers, power dividers, Amplifier power relations, Low noise amplifiers, Power amplifiers.

COURSE OUTCOMES:
CO1: Explain the characteristics of transmission lines and its losses.
CO2: Calculate the standing wave ratio and input impedance in high frequency transmission lines.
CO3: Analyze impedance matching by stubs using Smith Charts.
CO4: Comprehend the characteristics of TE and TM waves.
CO5: Design a RF transceiver system for wireless communication

TOTAL: 45 PERIODS

TEXTBOOKS
1. John D Ryder, “Networks lines and fields”, Prentice Hall of India, New Delhi, 2005. (Unit I–IV)

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43
LIST OF EXPERIMENTS:

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS
1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. RC Integrator and Differentiator circuits using Op-Amp
5. Clippers and Clampsers
6. Instrumentation amplifier
7. Active low-pass, High pass & Band pass filters
8. PLL Characteristics and its use as frequency multiplier, clock synchronization
9. R-2R ladder type D-A converter using Op-Amp

SIMULATION USING SPICE (Using Transistor):
1. Tuned Collector Oscillator
2. Twin-T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

Components and Accessories:
Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers. SPICE Circuit Simulation Software: (any public domain or commercial software)

Note: Op-Amps uA741, LM 301, LM311, LM 324, LM317, LM723, 7805, 7812, 2N3524, 2N3525, 2N3391, AD 633, LM 555, LM 565 may be used

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the students will be able to
CO1: Analyze various types of feedback amplifiers
CO2: Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
CO3: Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators, filters using SPICE Tool.
CO4: Design amplifiers, oscillators, D-A converters using operational amplifiers.
CO5: Design filters using op-amp and perform an experiment on frequency response

CO’s-PO’s & PSO’s MAPPING

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PTCEC366 IMAGE PROCESSING L T P C 3 0 0 3

COURSE OBJECTIVES:
- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

UNIT I DIGITAL IMAGE FUNDAMENTALS

UNIT II IMAGE ENHANCEMENT
UNIT III  IMAGE RESTORATION  

UNIT IV  IMAGE SEGMENTATION  

UNIT V  IMAGE COMPRESSION AND RECOGNITION  
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL :45 PERIODS

COURSE OUTCOMES
At the end of the course, the students should be able to:

CO1: Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.

CO2: Operate on images using the techniques of smoothing, sharpening and enhancement.

CO3: Understand the restoration concepts and filtering techniques.

CO4: Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

CO5: Comprehend image compression concepts.

TEXT BOOKS:

REFERENCES
PTEC3491  
COMMUNICATION SYSTEMS  

COURSE OBJECTIVES:
● To introduce Analog Modulation Schemes
● To impart knowledge in random process
● To study various Digital techniques
● To introduce the importance of sampling & quantization
● To impart knowledge in demodulation techniques
● To enhance the class room teaching using smart connectivity instruments

UNIT I  AMPLITUDE MODULATION  

UNIT II  RANDOM PROCESS & SAMPLING  
Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation. 
Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Nyquist criterion- Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM

UNIT III  DIGITAL TECHNIQUES  
Pulse modulation Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Digital Multiplexers, Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder
UNIT IV DIGITAL MODULATION SCHEME
Geometric Representation of signals - Generation, detection, IQ representation, PSD & BER of Coherent BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Spectrum Analysis – Occupied bandwidth – Adjacent channel power, EVM, Principle of DPSK

UNIT V DEMODULATION TECHNIQUES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course students will be able to
CO1: Gain knowledge in amplitude modulation techniques
CO2: Understand the concepts of Random Process to the design of communication systems
CO3: Gain knowledge in digital techniques
CO4: Gain knowledge in sampling and quantization
CO5: Understand the importance of demodulation techniques

TEXTBOOKS:

REFERENCES:
5. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006

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PTEC3461 COMMUNICATION SYSTEMS LABORATORY L T P C 0 0 3 1.5

COURSE OBJECTIVES:
- To study the AM & FM Modulation and Demodulation.
- To learn and realize the effects of sampling and TDM.
- To understand the PCM & Digital Modulation.
- To Simulate Digital Modulation Schemes.
- To Implement Equalization Algorithms and Error Control Coding Schemes.

LIST OF EXPERIMENTS
1. AM- Modulator and Demodulator
2. FM - Modulator and Demodulator
4. Signal sampling and TDM.
5. Pulse Code Modulation and Demodulation.
6. Pulse Amplitude Modulation and Demodulation.
7. Pulse Position Modulation and Demodulation and Pulse Width Modulation and Demodulation.
8. Digital Modulation – ASK, PSK, FSK.
10. Simulation of ASK, FSK, and BPSK Generation and Detection Schemes.
12. Simulation of Linear Block and Cyclic Error Control Coding Schemes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the laboratory course, the student will be able to understand the:
CO1: Design AM, FM & Digital Modulators for specific applications.
CO2: Compute the sampling frequency for digital modulation.
CO3: Simulate & validate the various functional modules of Communication system.
CO4: Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes.
CO5: Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system.

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COURSE OBJECTIVES:
- To study and understand the concepts and design of a Cellular System.
- To Study And Understand Mobile Radio Propagation And Various Digital Modulation Techniques.
- To Understand The Concepts Of Multiple Access Techniques And Wireless Networks

UNIT-I  THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS  9

UNIT-II  MOBILE RADIO PROPAGATION  9

UNIT- III MODULATION TECHNIQUES AND EQUALIZATION AND DIVERSITY  9
UNIT- IV MULTIPLE ACCESS TECHNIQUES


UNIT- V WIRELESS NETWORKING


TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon successful completion of the course the student will be able to:

CO1: Understand The Concept And Design Of A Cellular System.
CO3: Understand The Concepts Of Multiple Access Techniques And Wireless Networks
CO4: Characterize a wireless channel and evolve the system design specifications
CO5: Design a cellular system based on resource availability and traffic demands.

TEXT BOOK:

REFERENCES:
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PTEC3552 VLSI AND CHIP DESIGN

COURSE OBJECTIVES:
- Understand the fundamentals of IC technology components and their characteristics.
- Understand combinational logic circuits and design principles.
- Understand sequential logic circuits and clocking strategies.
- Understand ASIC Design functioning and design.
- Understand Memory Architecture and building blocks

UNIT I MOS TRANSISTOR PRINCIPLES
MOS logic families (NMOS and CMOS), Ideal and Non Ideal IV Characteristics, CMOS devices. MOS(FET) Transistor Characteristic under Static and Dynamic Conditions, Technology Scaling, power consumption

UNIT II COMBINATIONAL LOGIC CIRCUITS

UNIT III SEQUENTIAL LOGIC CIRCUITS AND CLOCKING STRATEGIES

UNIT IV INTERCONNECT, MEMORY ARCHITECTURE AND ARITHMETIC CIRCUITS
Interconnect Parameters – Capacitance, Resistance, and Inductance, Electrical Wire Models, Sequential digital circuits: adders, multipliers, comparators, shift registers. Logic Implementation using Programmable Devices (ROM, PLA, FPGA), Memory Architecture and Building Blocks, Memory Core and Memory Peripherals Circuitry
UNIT V  ASIC DESIGN AND TESTING

Introduction to wafer to chip fabrication process flow. Microchip design process & issues in test and verification of complex chips, embedded cores and SOCs, Fault models, Test coding. ASIC Design Flow, Introduction to ASICs, Introduction to test benches, Writing test benches in Verilog HDL, Automatic test pattern generation, Design for testability, Scan design: Test interface and boundary scan.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course the student will be able to

CO1: In depth knowledge of MOS technology

CO2: Understand Combinational Logic Circuits and Design Principles

CO3: Understand Sequential Logic Circuits and Clocking Strategies

CO4: Understand Memory architecture and building blocks

CO5: Understand the ASIC Design Process and Testing.

TEXTBOOKS


3. Michael J Smith,” Application Specific Integrated Circuits, Addison Wesley, (Unit - V)


REFERENCES


CO’s-PO’s & PSO’s MAPPING

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COURSE OBJECTIVES:
- To learn Hardware Descriptive Language (Verilog/VHDL).
- To learn the fundamental principles of Digital System Design using HDL and FPGA.
- To learn the fundamental principles of VLSI circuit design in digital domain.
- To learn the fundamental principles of VLSI circuit design in analog domain.
- To provide hands on design experience with EDA platforms.

LIST OF EXPERIMENTS:
1. Design of basic combinational and sequential (Flip-flops) circuits using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
2. Design an Adder; Multiplier (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
3. Design and implement Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software.
4. Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
5. Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
6. Design 3-bit synchronous up/down counter using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
7. Design 4-bit Asynchronous up/down counter using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.
10. Design and Simulate a CMOS Inverting Amplifier.
11. Design and Simulate basic Common Source, Common Gate and Common Drain Amplifiers.
12. Design and simulate simple 5 transistor differential amplifier.

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

CO1: Write HDL code for basic as well as advanced digital integrated circuit
CO2: Import the logic modules into FPGA Boards
CO3: Synthesize Place and Route the digital Ics
CO4: Design, Simulate and Extract the layouts of Digital & Analog IC Blocks using EDA tools
CO5: Test and Verification of IC design

TOTAL: 60 PERIODS
PTET3491  EMBEDDED SYSTEMS AND IOT DESIGN  L T P C

COURSE OBJECTIVES:

- Learn the architecture and features of 8051.
- Study the design process of an embedded system.
- Understand the real – time processing in an embedded system.
- Learn the architecture and design flow of IoT.
- Build an IoT based system.

UNIT I  8051 MICROCONTROLLER

UNIT II  EMBEDDED SYSTEMS

UNIT III  PROCESSES AND OPERATING SYSTEMS

UNIT IV  IOT ARCHITECTURE AND PROTOCOLS

UNIT V IOT SYSTEM DESIGN

PRACTICAL EXERCISES
Experiments using 8051.
2. Generation of Square waveform using 8051.
5. Design of a Digital Clock using Timers/Counters in 8051.
Experiments using ARM
Interfacing ADC and DAC
Blinking of LEDs and LCD
Interfacing keyboard and Stepper Motor.
Miniprojects for IoT
Garbage Segregator and Bin Level Indicator
Colour based Product Sorting
Image Processing based Fire Detection
Vehicle Number Plate Detection
Smart Lock System

COURSE OUTCOMES:
CO1: Explain the architecture and features of 8051.
CO2: Develop a model of an embedded system.
CO3: List the concepts of real time operating systems.
CO4: Learn the architecture and protocols of IoT.
CO5: Design an IoT based system for any application.

TEXTBOOKS :
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CO’s-PO’s & PSO’s MAPPING

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PTGE3791 HUMAN VALUES AND ETHICS L T P C 2 0 0 2

COURSE DESCRIPTION
This course aims to provide a broad understanding about the modern values and ethical principles that have evolved and are enshrined in the Constitution of India with regard to the democratic, secular and scientific aspects. The course is designed for undergraduate students so that they could study, understand and apply these values in their day to day life.

COURSE OBJECTIVES:
➢ To create awareness about values and ethics enshrined in the Constitution of India
➢ To sensitize students about the democratic values to be upheld in the modern society.
➢ To inculcate respect for all people irrespective of their religion or other affiliations.
➢ To instill the scientific temper in the students’ minds and develop their critical thinking.
➢ To promote sense of responsibility and understanding of the duties of citizen.

UNIT I DEMOCRATIC VALUES 6
Reading Text: Excerpts from John Stuart Mills’ On Liberty

UNIT II SECULAR VALUES 6
Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices.

Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani
UNIT III  SCIENTIFIC VALUES

Reading Text: Excerpt from *The Scientific Temper* by Antony Michaelis

UNIT IV  SOCIAL ETHICS
Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices.

Reading Text: Excerpt from *21 Lessons for the 21st Century* by Yuval Noah Harari

UNIT V  SCIENTIFIC ETHICS
Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society.


REFERENCES:
4. The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,
5. Research Methodology for Natural Sciences by Soumitro Banerjee, IISc Press, January 2022

COURSE OUTCOMES
Students will be able to
CO1: Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
CO2: Practice democratic and scientific values in both their personal and professional life.
CO3: Find rational solutions to social problems.
CO4: Behave in an ethical manner in society
CO5: Practice critical thinking and the pursuit of truth.
COURSE OBJECTIVES:

- Study the fundamentals of speech signal and extract various speech features
- Understand different speech coding techniques for speech compression applications
- Learn to build speech enhancement, text-to-speech synthesis system

UNIT I  FUNDAMENTALS OF SPEECH  6
The Human speech production mechanism, Discrete-Time model of speech production, Speech perception - human auditory system, Phonetics - articulatory phonetics, acoustic phonetics, and auditory phonetics, Categorization of speech sounds, Spectrographic analysis of speech sounds, Pitch frequency, Pitch period measurement using spectral and cepstral domain, Formants, Evaluation of Formants for voiced and unvoiced speech.

UNIT II  SPEECH FEATURES AND DISTORTION MEASURES  6
Significance of speech features in speech-based applications, Speech Features – Cepstral Coefficients, Mel Frequency Cepstral Coefficients (MFCCs), Perceptual Linear Prediction (PLP), Log Frequency Power Coefficients (LFPCs), Speech distortion measures–Simplified distance measure, LPC-based distance measure, Spectral distortion measure, Perceptual distortion measure.

UNIT III  SPEECH CODING  6

UNIT IV  SPEECH ENHANCEMENT  6

UNIT V  SPEECH SYNTHESIS AND APPLICATION  6
A Text-to-Speech systems (TTS), Synthesizers technologies – Concatenative synthesis, Use of Formants for concatenative synthesis, Use of LPC for concatenative synthesis, HMM-based synthesis, Sinewave synthesis, Speech transformations, Watermarking for authentication of a speech, Emotion recognition from speech.

30 PERIODS
PRACTICAL EXERCISES: 30 PERIODS
1. Write a MATLAB Program to classify voiced and unvoiced segment of speech using various time-domain measures
2. Write a MATLAB Program to calculate the MFCC for a speech signal
3. Implement ITU-T G.722 Speech encoder in MATLAB
4. Write a MATLAB Program to implement Wiener Filters for Noise Reduction
5. Design a speech emotion recognition system using DCT and WPT in MATLAB

HARDWARE & SOFTWARE SUPPORT TOOLS:
- Personal Computer with MATLAB
- Microphone and Speakers

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: Understand the fundamentals of speech.
CO2: Extract various speech features for speech related applications
CO3: Choose an appropriate speech coder for a given application.
CO4: Build a speech enhancement system.
CO5: Build a text-to-speech synthesis system for various applications

TEXT BOOKS:
1. Shaila D. Apte, Speech and Audio Processing, Wiley India (P) Ltd, New Delhi, 2012

REFERENCES:

CO's-PO's & PSO's MAPPING

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OBJECTIVES:
The student should be made to:
- To know the hardware requirement of wearable systems
- To understand the communication and security aspects in the wearable devices
- To know the applications of wearable devices in the field of medicine

UNIT I  
INTRODUCTION TO WEARABLE SYSTEMS AND SENSORS  
9

UNIT II  
SIGNAL PROCESSING AND ENERGY HARVESTING FOR WEARABLE DEVICES  
9
Wearability issues - physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements- Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.

UNIT III  
WIRELESS HEALTH SYSTEMS  
9

UNIT IV  
SMART TEXTILE  
9

UNIT V  
APPLICATIONS OF WEARABLE SYSTEMS  
9
Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, neural recording, Gait analysis, Sports Medicine.

OUTCOMES:
On successful completion of this course, the student will be able to
- CO1: Describe the concepts of wearable system.
- CO2: Explain the energy harvestings in wearable device.
- CO3: Use the concepts of BAN in health care.
- CO4: Illustrate the concept of smart textile
- CO5: Compare the various wearable devices in healthcare system

TOTAL PERIODS: 45
TEXT BOOKS

REFERENCES

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PTCEC369 IOT PROCESSORS L T P C 2 0 2 3

COURSE OBJECTIVES:
- Learn the architecture and features of ARM.
- Study the exception handling and interrupts in CORTEX M3
- Program the CORTEX M3
- Learn the architecture of STM 32L15XXX ARM CORTEX M3/M4 microcontroller.
- Understand the concepts of System – On – Chip (SoC)

UNIT I OVERVIEW OF ARM AND CORTEX-M3

UNIT II  CORTEX EXCEPTION HANDLING AND INTERRUPTS  
Exception Types, Priority, Vector Tables, Interrupt Inputs and Pending behaviour, Fault Exceptions, Supervisor Call and Pendable Service Call, NVIC: Nested Vector Interrupt Controller, Overview, Basic Interrupts, SYSTICK Time, Interrupt Behaviour, Interrupt/Exception Sequences, Exception Exits, Nested Interrupts, Tail – Chaining Interrupts, Late Arrivals and Interrupt Latency.

UNIT III  CORTEX M3/M4 PROGRAMMING  

UNIT IV  STM32L15XXX ARM CORTEX M3/M4 MICROCONTROLLER AND DEBUGGING TOOLS  

UNIT V  INTRODUCTION TO SYSTEM – ON – CHIP  

PRACTICAL EXERCISES:  
ARM Assembly Programming  
1. Write a program to add two 32-bit numbers stored in r0 and r1 registers and write the result to r2. The result is stored to a memory location. a) Run the program with breakpoint and verify the result b) Run the program with stepping and verify the content of registers at each stage.  
2. Write ARM assembly to perform the function of division. Registers r1 and r2 contain the dividend and divisor, r3 contains the quotient, and r5 contains the remainder.

Embedded C Programming on ARM Cortex M3/M4 Microcontroller  
1. Write a program to turn on green LED (Port B.6) and Blue LED (Port B.7) on STM32L-Discovery by configuring GPIO.  
2. Transmit a string “Programming with ARM Cortex” to PC by configuring the registers of USART2. Use polling method.
ARM Cortex M3/M4 Programming with CMSIS

1. Write a program to toggle the LEDs at the rate of 1 sec using standard peripheral library. Use Timer3 for Delay.
2. Transmit a string “Programming with ARM Cortex” to PC by using standard peripheral library with the help of USART3. Use polling method.

COURSE OUTCOMES:
On successful completion of this course, the student will be able to

CO1: Explain the architecture and features of ARM.
CO2: List the concepts of exception handling.
CO3: Write a program using ARM CORTEX M3/M4.
CO4: Learn the architecture of STM32L15XXX ARM CORTEX M3/M4.
CO5: Design an SoC for any application.

TOTAL:60 PERIODS

TEXTBOOKS


REFERENCES


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COURSE OBJECTIVES

- To study the various network layer and transport layer protocols for wireless networks
- To study the architecture and interference mitigation techniques in 3G standards
- To learn about 4G technologies and LTE-A in mobile cellular network.
- To learn about the layer level functionalities in interconnecting networks.
- To study the emerging techniques in 5G network.

UNIT I  WIRELESS PROTOCOLS

Mobile network layer - Fundamentals of Mobile IP, data forwarding procedures in mobile IP, IPv4, IPv6, IP mobility management, IP addressing - DHCP, Mobile transport layer - Traditional TCP, congestion control, slow start, fast recovery/fast retransmission, classical TCP improvements- Indirect TCP, snooping TCP, Mobile TCP.

UNIT II  3G EVOLUTION


UNIT III  4G EVOLUTION

Introduction to LTE-A – Requirements and Challenges, network architectures – EPC, E-UTRAN architecture - mobility management, resource management, services, channel -logical and transport channel mapping, downlink/uplink data transfer, MAC control element, PDU packet formats, scheduling services, random access procedure.

UNIT IV  LAYER-LEVEL FUNCTIONS

Characteristics of wireless channels - downlink physical layer, uplink physical layer, MAC scheme -frame structure, resource structure, mapping, synchronization, reference signals and channel estimation, SC-FDMA, interference cancellation – CoMP, Carrier aggregation, Services - multimedia broadcast/multicast, location-based services.

UNIT V  5G EVOLUTION


TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the student will be able to

CO1: Design and implement the various protocols in wireless networks.
CO2: Analyze the architecture of 3G network standards.
CO3: Analyze the difference of LTE-A network design from 4G standard.
CO4: Design the interconnecting network functionalities by layer level functions.
CO5: Explore the current generation (5G) network architecture.

TEXTBOOKS

REFERENCES

CO’s-PO’s & PSO’s MAPPING

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PTCEC360 UNDERWATER NAVIGATION SYSTEMS L T P C 3 0 0 3

COURSE OBJECTIVES:
- To Understand the relationship between autonomy, sensing, navigation and control on an un-manned marine subsea vehicle.
- To understand about various types of navigational equipment & sensors
- To understand the basic communication methods and signal losses, attenuation.
- To understand the types of Acoustic transponders, Beacon and Responder

UNIT I BASICS OF UNDERWATER COMMUNICATION 9
Introduction to underwater acoustics, Understanding Thermoclines in Ocean Waters, subsea communication sensors, Instruments and applications, Sound propagation in the ocean – Sound Velocity Profiles (SVP) in the deep water and shallow water; Sound attenuation in the sea – absorption, scattering, transmission loss, reverberation, Snell’s law, target strength; Laser
communication and limitations.

UNIT II UNDERWATER NAVIGATION & ITS AIDING SENSOR AND DEVICES
Different types of navigational sensors, Accelerometers, Fiber Optic Gyroscopes (FOGs), Ring Laser Gyroscope (RLG) types and Working principles, and their applications, Doppler Velocity Log, Error sources in subsea navigation, Calibration overview for subsea navigation. Attitude Heading and Reference Systems (AHRS) & IMU

UNIT III ACOUSTIC POSITIONING SYSTEMS
Subsea navigation possible solutions, Vehicle positioning, Acoustic Positioning systems, Short Base Line (SBL), Super Short Base Line (SSBL), Long Base line (LBL) Configurations and Positioning overview.

UNIT IV SUBSEA VEHICLE NAVIGATION
Subsea navigation, Uses of subsea navigation, challenges of subsea navigation. Basics of underwater navigation, Types of underwater Navigations, Aided navigational systems, Inertial Navigational systems. role of dead-reckoning navigation in subsea navigation, Kalman filters (XKF) and Invariant extended Kalman filters for navigation.

UNIT V CASE STUDY
- Tethered vehicle deployment guidelines and preparedness.
- AUV /ROV based search operation requirements and planning.
- Tethered crawling vehicle sensors, data acquisition and maneuvering.
- Acoustic positioning system transponder deployment and recovery.
- Aided and unaided navigation system study.
- Understand the basic tools needed to effectively develop software for robotic platforms in a group environment, and resolve conflicts and adhere to group goals in the software cycle.

COURSE OUTCOMES:
On successful completion of this course, the student will be able
CO1: To know about the Underwater Navigation System
CO2: To know about the INS and its aiding sensor
CO3: To know about the challenges involved in underwater navigation
CO4: To study about how navigation system is integrated with manned and unmanned underwater vehicles
CO5: To know about underwater positioning system

TOTAL: 45 PERIODS

TEXT BOOKS
1. Fundamentals of ocean acoustics by L.M.Brekhovskikh and Yu. P. Lysanov
3. Underwater Acoustic Positioning Systems by P. H. Milne
REFERENCES BOOKS
1. Electronic and Acoustic Navigation systems for Maritime Studies by Norvald Kjerstad
2. Guidance & Control of Ocean Vehicles by TT Fossen
3. Dynamic Positioning of Offshore Vessels. By Morgan, M.

CO’s-PO’s & PSO’s MAPPING

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PTCEC349 RFID SYSTEM DESIGN AND TESTING L T P C

COURSE OBJECTIVES:
- To discuss the fundamentals of near field and far field RFID communications
- To articulate the standards and protocols used in RFID systems
- To describe the operating principles of RFID tag and reader
- To introduce the security aspects and system architecture of RFID systems
- To illustrate the industrial and scientific applications of RFID systems

UNIT I INTRODUCTION

UNIT II RFID STANDARDS AND PROTOCOLS

UNIT III OPERATING PRINCIPLES
RFID Tag components: RFID tag types – the 1-Bit Transponder and Chipless Tags – RFID readers and middleware component – Communication fundamentals: Coupling, Data encoding, multi-path effect – Tag, Reader and sensor communication.

UNIT IV DATA INTEGRITY AND SECURITY
The checksum procedure – Multiaccess procedures – Attacks on RFID Systems – Protection by Cryptographic measures

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UNIT V  RFID ENABLED SENSORS AND APPLICATIONS

RFID enabled Sensors: Antenna design challenges – IC design – Integration of sensors and RFID – Power consumption and Link budget.


PRACTICAL EXERCISES:
1. Design of a passive RFID Tag Antenna
2. Design of an RFID reader antenna
3. Determination of read range of the RFID tag at UHF and Microwave frequencies
4. Determination of RFID tag performance for different standards

30 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:

CO1: Classify RFID systems based on frequency, architecture and performance
CO2: Define standards for RFID technology
CO3: Illustrate the operation of various components of RFID systems
CO4: Describe the privacy and security issues in RFID Systems
CO5: Discuss the construction and applications of RFID enabled sensor

TOTAL:60 PERIODS

TEXTBOOKS

REFERENCES

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COURSE OBJECTIVES:
- Introduce the concept of wide band gap (WBG) devices and its application in real world
- Advantages and disadvantages of WBG devices
- Provide an introduction to basic operation of WBG power devices
- Learn Design principles of modern power devices
- Ability to deal high frequency design complexity

UNIT I  WBG DEVICES AND THEIR APPLICATION IN REAL WORLD  6
Review of semiconductor basics, Operation and characteristics of the SiC Schottky Barrier Diode, SiC DMOSFET and GaN HEMT, Review of Wide bandgap semiconductor technology - Advantages and disadvantages

UNIT II  SWITCHING CHARACTERIZATION OF WBG  6
Turn-on and Turn-off characteristics of the device, Hard switching loss analysis, Double pulse test set-up

UNIT III  DRIVERS FOR WIDE BAND GAP DEVICES  6
Gate driver, Impact of gate resistance, Gate drivers for wide bandgap power devices, Transient immunity integrated gate drivers

UNIT IV  HIGH FREQUENCY DESIGN COMPLEXITY AND PCB DESIGNING  6
Effects of parasitic inductance, Effects of parasitic capacitance, EMI filter design for high frequency power converters, High frequency PCB design, Conventional power loop design, High frequency power loop optimization, Separation of power from signal PCB

UNIT V  APPLICATIONS OF WIDE BANDGAP DEVICES  6
Consumer electronics applications, Wireless power transfer applications, Electric vehicle applications, Renewable energy sources applications

30 PERIODS

PRACTICAL EXERCISES:
1. Conduct switching loss and Magnetic loss on Low side
2. Conduct Double pulse test (DPT) and learn IEC 60747 -8/9 standards
3. Conduct experiments for Diode reverse recovery on High side
4. Conduct Power analysis and harmonic measurement
5. Measure Turn on/off delay, Calculate recovery softness factor, measure reverse recovery energy.

List of Equipments needed for 30 students in a batch (6 students in bench)
2. 1GHz Flexi channel oscilloscope with 6 channels - #5
3. 2ch AFG with 9inch touchscreen and built-in Double Pulse Test application to generate atleast 2 varying pulse widths, 16Mpts memory - #1
4. Power supplies - Programmable DC Power Supply, 720W (for High Voltage side) and Programmable Single Channel DC Power Supply, 192W (to drive Gate drive circuit) - #1
5. Voltage Probes to measure Vgs (low side) – passive probe or differential probe 200MHz - #15
6. Voltage Probes to measure Vgs (high side) – 1GHz, isolated probes with MMCX adapter tips – #1 nos
7. Current Probes to measure drain current – 30A with 120Mz BW - #5

COURSE OUTCOMES:
Upon successful completion of the course the student will be able to
CO1: Students master design principles of power devices
CO2: Students become familiar with reliability issues and testing methods
CO3: An ability to design and conduct experiments, as well as to analyze and interpret data
CO4: Student to get real life experience and to know practical applications of WBG
CO5: Indepth knowledge on practical usage of this technology

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

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COURSE OBJECTIVES:

- Study the architecture of programmable DSP processors
- Learn to implement various standard DSP algorithms in DSP Processors
- Use the Programmable DSP Processors to build real-time DSP systems

UNIT I ARCHITECTURES FOR PROGRAMMABLE DSP PROCESSORS 6

Basic Architectural features, DSP Computational building blocks, Bus architecture and memory, Data addressing capabilities, Address generation Unit, Programmability and program execution, Speed issues, Features for external interfacing

UNIT II TMS320C5X PROGRAMMABLE DSP PROCESSOR 6

Architecture of TMS320C54xx DSP processors, Addressing modes – Assembly language Instructions -Memory space, interrupts, and pipeline operation of TMS320C54xx DSP Processor, On-Chip peripherals, Block Diagram of TMS320C54xx DSP starter kit

UNIT III TMS320C6X PROGRAMMABLE DSP PROCESSOR 6

Commercial TI DSP processors, Architecture of TMS320C6x DSP Processor, Linear and Circular addressing modes, TMS320C6x Instruction Set, Assembler directives, Linear Assembly, Interrupts, Multichannel buffered serial ports, Block diagram of TMS320C67xx DSP Starter Kit and Support Tools

UNIT IV IMPLEMENTATION OF DSP ALGORITHMS 6


UNIT V APPLICATIONS OF DSP PROCESSORS 6


PRACTICAL EXERCISES: 30 PERIODS

1. Real-Time Sine Wave Generation
2. Programming examples using C, Assembly and linear assembly
3. Implementation of moving average filter
4. FIR implementation with a Pseudorandom noise sequence as input to a filter
5. Fixed point implementation of IIR filter
6. FFT of Real-Time input signal

**HARDWARE & SOFTWARE SUPPORT TOOLS:**
- TMS320C54xx/TMS320C67xx DSP Development board
- Code Composer Studio (CCS)
- Function Generator and Digital Storage Oscilloscope
- Microphone and speaker

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES**

At the end of this course, the students will be able to:
- **CO1**: Understand the architectural features of DSP Processors.
- **CO2**: Comprehend the organization of TMS320C54xx DSP processors
- **CO3**: Build solutions using TMS320C6x DSP Processor
- **CO4**: Implement DSP Algorithms
- **CO5**: Study the applications of DSP Processors.

**TEXT BOOKS**


**REFERENCES**

2. TMS320C5416/6713 DSK user manual at [https://www.ti.com](https://www.ti.com)

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COURSE OBJECTIVES:
- IoT Nodes & Sensors
- IoT Gateways
- IoT Cloud Systems
- IoT Cloud Dashboards
- Challenges in IoT system Design – Hardware & Software

UNIT I UNDERSTANDING IOT CONCEPT AND DEVELOPMENT PLATFORM 6
IOT Definition, Importance of IoT, Applications of IoT, IoT architecture, Understanding working of Sensors, Actuators, Sensor calibration, Study of Different sensors and their characteristics

UNIT II ANALYZING & DECODING OF COMMUNICATION PROTOCOL USED IN IOT DEVELOPMENT PLATFORM 6
UART Communication Protocol, I2C Protocol device interfacing and decoding of signal, SPI Protocol device interfacing and decoding of signal, WIFI and Router interfacing, Ethernet Configuration, Bluetooth study and analysis of data flow, Zigbee Interfacing and study of signal flow

UNIT III IOT PHYSICAL DEVICES AND ENDPOINTS AND CONTROLLING 6
HARDWARE AND SENSORS
IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry Pi with focus on interfacing external gadgets; controlling output, reading input from pins.
Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors;

UNIT IV CLOUD SERVICES USED IN IOT DEVELOPMENT PLATFORM 6
Configuration of the cloud platform; Sending data from the IOT nodes to the gateways using different communication options; Transferring data from gateway to the cloud; Exploring the web services like mail, Messaging (SMS) and Twitter etc.; Tracking of cloud data as per the requirement; Google Cloud service architect; AWS cloud Services architect; Microsoft Azure cloud services Architect; OEN source Cloud Services; Initial State Iot Dashboard & Cloud Services

UNIT V CHALLENGES IN IOT SYSTEM DESIGN – HARDWARE & SOFTWARE 6
Antenna design and placement, Chip-package system development, Power electronics, electromagnetic interference/compatibility (EMI/EMC), Electronics reliability; Battery simulation.
PRACTICAL EXERCISES: 30 PERIODS

Study and Program different Sensors for IoT applications

- LDR sensor, IR sensor, Temperature Sensor, Ultrasound Sensor, Gas sensor
- Write a program using IR sensor for working morning alarm and night lamp
- Write a program using Temperature sensor for detecting heat / fire
- Write a program using Gas sensor for detecting LPG gas leak
- Write a program using Ultrasound sensor for range detection
- Write a program using sensors for carparking assist
- Write a program using sensors for water level indicator and overflow detection

2. Designing and debugging complex mixed signal devices (analog, digital, and RF)

- Write a program to interface Bluetooth and implement DC Motor.
- Write a program to control LEDs using Alexa Echo Dot.
- Write a program to control Buzzer using Alexa Echo Dot.
- Write a program to control DC motor using Google Assistance.
- Write a program to control Stepper motor using Google Assistance
- Studying Bluetooth analysis and measurement of Signals
- Studying WLAN analysis of 802.11a/b/g/j/p, 802.11n, 802.11ac Signals

3. Understanding battery requirements

- Determining ultra-low deep sleep current of Node
- Measuring Transmit and Receive current signals of Node
- Capturing short transients and fast transients signals of node
- Recording Device(node) operations over extended states.
- Create stable low noise voltage supply for every state of your IOT devices, from sleep to transmit .
- Record and Generate Battery sources with the battery simulation options

4. Understanding Modulation techniques –

- Understanding of ASK, FSK Modulation and measurements
- Capturing the live ASK Signal and decoding it.
- Understanding the BPSK, QPSK & QAM Modulation Techniques and analysis.
- Understanding the APSK & APCO modulation & analysis.

List of equipment for a batch of 30 students (3 in a bench):

- Real time Spectrum Analyser upto atleast 6.2GHz and 40MHz bandwidth – Qty #1
- DC Power supply - 120W with Battery simulation – Qty #1
- Graphical Digital Multimeter with built-in digitizer and datalogging for 20 channels – Qty #1
- 200MHz 6 channel scope with Serial trigger & decode capability for I2C, SPI, RS-232/422/485/UART buses, and built-in 50MHz AFG and 8 digital channel analysis – Qty #1
- AI Node with pre-configured SSD, USB Camera, USB Hub, USB Mouse, and USB Keyboard. – Qty 1no
- Sensor IOT Application Board with built-in 7 sensors (LDR #2, IR #2, Temperature #1, Ultrasound #1 and LPG Gas sensors #1); Embedded uC mother board, LCD display, Buzzer, Power supply (12V,1A) with adaptor and PCB Base plate; - Qty 5 nos
- All in One General Purpose Board
- IOT Gateway – Qty 1no
- Bluetooth Module– Qty 1no
- Router – Qty 1no
- Portable Sensor Kit – Qty 1no
- IOT sensor kit – Qty 1no
- RFID Module – Qty 1no
- Finger Print Module – Qty 1no
- Stepper Motor – Qty 1no
- DC Motor – Qty 1no
- Amazon Echo device – Qty 2nos

COURSE OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Understand the building blocks of IoT technology and explore the vast spectrum of IoT applications
CO2: Use processors & peripherals to design & build IoT hardware
CO3: Assess, select and customize technologies for IoT applications
CO4: Connect numerous IOT applications with the physical world of humans and real life problem solving.
CO5: Design and implement IOT applications that manage big data

TOTAL: 60 PERIODS

TEXT BOOKS

REFERENCES

3. Editors Ovidiu Vermesan
CO’s-PO’s & PSO’s MAPPING

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**PTCEC359** UNDERWATER INSTRUMENTATION SYSTEMS

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**COURSE OBJECTIVES:**
- To learn basics of underwater vehicle control system
- To know the basic sensors and transducers used in underwater vehicles
- To learn the types of communication systems
- To learn different types of underwater vehicles and their applications.
- To learn about subsea battery and power management system

**UNIT I** INTRODUCTION ON DATA ACQUISITION AND CONTROL SYSTEM 9

Introduction on PLC& various Input / Output modules, SCADA and HMI, Real time Controller, Signal conditioning circuits and associated components: Ethernet Modem, SMPS, Media converters, Ethernet switches, Fuses & Fuse holders, Power supply units, Power management system, Pressure Compensator, Pressure compensated batteries, Volve amplifiers, Actuators, Types of valves- proportional valves and solenoid valves, Types of relays- Solid State Relay and Electromagnetic relay, Pressure casing for underwater DACS.

**UNIT II** UNDERWATER SENSORS AND TRANSDUCERS 9

Navigation and Auxiliary sensors and Transducers

Inertial Navigation System, FOG/RLG, GPS, DGPS, Gyroscope, Motion Reference Unit, Doppler Velocity Log, Acoustic Transponder, Beacon, Positioning System- LBL, SBL, SSBL, Underwater Encoder, Proximity switches, Conductivity sensor, Temperature sensor, Depth sensor, Accelerometer, Tilt sensor, LVDT, Vacumm sensor, Current meters.

**Scientific Instruments**

Acoustic Doppler Current Profiler, Echosounder, Hydrophones, SONAR- Forward looking SONAR, Bottom Looking SONAR, Altimeter, Swell and wave sensor, PH sensor, Turbidity sensor, Oxygen sensor, Water samplers, Nitrogen sensor, CTD
UNIT III  TELEMETRY SYSTEM
Telemetry system for tethered vehicles, Fiber optic communication, Single mode fiber, Multimode fiber, Fiber optics in oceanographic applications, Basis of optical fiber transmission, Fiber losses and signal attenuation, Slip rings, Umbilical cables, Underwater cables and connectors, Field installable Termination Assembly
Acoustic communication: Acoustic wave propagation, Optical communication, Satellite communication- Iridium, Inmarsat, Argos for surface Tracking.

UNIT IV  TYPES OF UNDERWATER VEHICLES
Type of vehicles, manned and unmanned vehicles, Tethered and untethered vehicles, Remotely Operable Vehicle (ROV), Autonomous Underwater vehicle (AUV), Gliders, Solar powered Gliders, Manned submersible, Submarines, Deep Sea Rescue vehicle (DSRV), Various Propulsion systems.

UNIT V  CASE STUDY
Design of low power DAC system for portable instrument, Design of power module for autonomous system, Design consideration on wireless sensor network and its important, MEMS systems used in underwater systems and its merits and demerits.

COURSE OUTCOMES:
On successful completion of this course, the student will be able to
CO1: Design of DAC system for various underwater Applications
CO2: Knowledge about sensors used underwater and their working principle
CO3: Underwater communication system and their application
CO4: Knowledge about different types of underwater vehicles
CO5: Subsea battery and Battery Management System

BOOK REFERENCES
1. The Ocean engineering Handbook, Ferial El- Hawary
2. Guidance and control of Ocean Vehicles, Thor I Fossen
3. Instrumentation and metrology in Oceanography by Marc Le mann
4. Jane’s Underwater technology,, Technology and applications of AUV by Gwyn Griffiths
5. Fundamentals of Marine Vehicle Control, Karl Von Ellenrieder
6. Instrumentation & control G J Roy
7. Handbook of ocean and underwater engineering, Myers, J J; Holm, C H; McAllister, R F
8. Underwater communication and Network, Yi Lou, Niaz Ahmed

CO’s-PO’s & PSO’s MAPPING

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TOTAL: 45 PERIODS
PTCEC347 RADAR TECHNOLOGIES

COURSE OBJECTIVES:
The student should be made to:
- Understand the basics of Radar and Radar equation
- Understand the types of Radar
- Understand tracking Radar
- Understand the various signal processing in Radar
- Understand the Subsystems in Radar

UNIT I INTRODUCTION TO RADAR EQUATION
9

UNIT II CW, MTI AND PULSE DOPPLER RADAR
9
CW and Frequency Modulated Radar, Doppler and MTI Radar - Delay Line Cancellers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance, MTI from a Moving Platform (AMIT), Pulse Doppler Radar.

UNIT III TRACKING RADAR
9
Tracking with Radar, Monopulse Tracking, Conical Scan, Sequential Lobing, Limitations to Tracking Accuracy, Low-Angle Tracking - Comparison of Trackers, Track while Scan (TWS) Radar - Target prediction, state estimation, Measurement models, alpha – beta tracker, Kalman Filtering, Extended Kalman filtering.

UNIT IV RADAR SIGNAL PROCESSING
9
UNIT V  RADAR TRANSMITTERS AND RECEIVERS


TOTAL: 45 PERIODS

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

CO1: Identify the Radar parameters
CO2: Differentiate various radar types
CO3: Evaluate different tracking and filtering schemes
CO4: Apply signal processing in target detection
CO5: Design Radar transmitter and receiver blocks

TEXT BOOKS

REFERENCES

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PTCEC339  FUNDAMENTALS OF NANOELECTRONICS  L T P C
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COURSE OBJECTIVES:

- To understand the concepts of nano electronics and quantum electronics
- To understand the concepts of nano electronic devices, transistors, tunneling devices and superconducting devices
- To understand the basics of nanotube devices
UNIT I  INTRODUCTION TO NANO ELECTRONICS  6

Scaling to nano - Light as a wave and particle- Electrons as waves and particles- origin of quantum mechanics - General postulates of quantum mechanics - Time independent Schrodinger wave equation- Electron confinement - Quantum dots, wires and well-Spin and angular momentum

UNIT II  QUANTUM ELECTRONICS  6


UNIT III  NANO ELECTRONIC TRANSISTORS  6

Coulomb blockade - Coulomb blockade in Nano capacitors - Coulomb blockade in tunnel junctions - Single electron transistors, Semiconductor nanowire FETs and SETs, Molecular SETs and molecular electronics - Memory cell.

UNIT IV  NANO ELECTRONIC TUNNELING AND SUPER CONDUCTING DEVICES  6


UNIT V  NANOTUBES AND NANOSTRUCTURE DEVICES  6


PRACTICAL EXERCISES:  30 PERIODS

T-CAD/ Any other relevant software based Simulations

1. Field Effect Transistors
2. Single Electron Transistors
3. Tunneling devices

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

CO1: Understand the basics of nano electronics including quantum wires, dots and wells

CO2: Use the mechanism behind quantum electronic devices

CO3: Analyze the key performance aspects of tunneling and superconducting nano electronic devices

CO4: Apply the knowledge in the development of nanotubes and nanostructure devices

TOTAL:60 PERIODS
TEXTBOOKS

REFERENCES


4. Brajesh Kumar Kaushik, Nanoelectronics: Devices, Circuits and Systems, Elsevier science, 2018

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PTCEC357 UNDERWATER COMMUNICATION L T P C

COURSE OBJECTIVES:
- To learn about fiber optic communication for underwater application
- To learn underwater MI communication and sensor networking
- To understand underwater acoustic communication
- To understand the challenges in underwater communication
- To learn underwater cables and handling system for various application

UNIT I UNDERWATER FIBRE OPTICS COMMUNICATION 6

UNIT II UNDERWATER OPTICAL COMMUNICATION 6
Introduction, Classification of Underwater Wireless Optical Communication Links, Underwater

UNIT III UNDERWATER MI COMMUNICATION & SENSOR NETWORKS  6

UNIT IV BASIC PRINCIPLES OF UNDERWATER ACOUSTIC COMMUNICATION  6
Ocean Acoustic environment; Measuring sound levels and relevant units; Sound propagation in the ocean – sound velocity profiles in the deep water and shallow water Speed of underwater sound, Underwater Sound Transmission Loss, Acoustic Field Model: Ray Theory Model, Structure and Performance of UWAC System: Basic Structure of UWAC System, Performance Indicators of UWAC System, Characteristics of the UWA Channel.

UNIT V UNDERWATER ACOUSTIC NETWORK TECHNOLOGY  6

30 PERIODS

PRACTICALEXERCISES:  30 PERIODS
1. Conducting an experiment for testing of optical communication in water tank with clear and turbid water.
2. Measure the insertion loss of different FO connectors, bending losses using optical power meter.
3. Testing of MI communication and Sensor network
4. Testing of hydrophone and acoustic communication with different operating frequency and
5. Design a MI coil and testing it for Inductive communication

COURSE OUTCOMES:
On successful completion of this course, the student will be able to

CO1: To get an explore to different underwater communication system
CO2: Design of MI coil for
CO3: To know the important of underwater communication and its challenges
CO4: To understand the strength of Underwater acoustic communication
CO5: To understand the sensor network concepts and its application

TOTAL:60 PERIODS
**TEXTBOOKS**

**REFERENCES**

**CO's-PO's & PSO's MAPPING**

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**PTCEC353**

**SIGNAL INTEGRITY**

**COURSE OBJECTIVES:**
- Understand characteristic impedance of transmission line and impedance matching techniques.
- Understand plain signal reflection and cross talk noise in the transmission line, and also explain the mathematical analysis method.
- Understand Eye diagram and related measurement to test quality of Signal
- Learn Jitter analysis and jitter decomposition
- Work with high frequency differential signal and its applications

**UNIT I**

**SIGNAL REFLECTION AND IMPEDANCE MATCHING TECHNIQUE**

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Phenomenon of signal reflection. Signal reflection at transmitting end.
Signal reflection at branch point. Multiple reflection in transmission line.
Prevention of signal reflection by using impedance matching technique.

**UNIT II**

**CROSSTALK NOISE**

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Crosstalk definition and classification. Crosstalk mechanism. Analysis of crosstalk noise in transmission line. Main factor of causing crosstalk noise.
UNIT III  DIFFERENTIAL SIGNAL TRANSMISSION CIRCUIT.  

UNIT IV  FREQUENCY RESPONSE OF A CIRCUIT  
Frequency response of transmission line and circuit. Inter-symbol interference (ISI) and eye-pattern. Deterioration of a signal waveform due to ISI. Circuit techniques to prevent the deterioration. Linear time-invariant systems. Frequency response of pulse.

UNIT V  EYE DIAGRAM AND JITTER  
Jitter Definition and Types of Jitter; Jitter decomposition; Eye diagram analysis and related measurement

PRACTICAL EXERCISES:  
1. Generating 1GHz Differential signal from AWG  
2. Getting Eye on oscilloscope and conduct various measurement on Eye as well Timing parametric such as rise/fall times, pulse width, and duty cycle Programmable software clock recovery including software PLL .  
3. Accurate jitter analysis using the spectral and Q-scale methods for detailed decomposition of jitter components, including the extraction of industry standard dual-dirac model parameters  
4. Generate LVDS signal and conduct signal integrity measurement

List of Equipments needed:  
- 2Ch 1 GHz Arbitrary waveform generator  
- 2GHz 4 flex channel scope with automated jitter and eye diagram measurement  
- LVDS measurement suite

COURSE OUTCOMES:  
At the end of this course, the students will be able to:  
CO1: Familiarity with High speed design and related issues  
CO2: Understanding on critical design aspect  
CO3: Know about Jitter and related measurements which is critical for design  
CO4: Practical application of high speed differential signals  
CO5: Measurement expertise up to industry expectations

TOTAL: 60 PERIODS

TEXT BOOKS  
2. High Speed Digital Design by Howard Johnson and Martin Graham, Prentice Hall, 1st Edition
REFERENCES

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PTCEC336 AVIONICS SYSTEMS  
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COURSE OBJECTIVES:
- To impart knowledge on the needs for avionics for both Civil and military aircraft.
- To impart knowledge on avionics architecture and Avionics data bus.
- To impart knowledge understand the various cockpit displays and human interfaces.
- To impart knowledge on the concepts of flight control systems, FMS and their importance
- To impart knowledge on different navigation aids and need for certification

UNIT I  INTRODUCTION TO AVIONICS  9

UNIT II  DIGITAL AVIONICS BUS ARCHITECTURE  9

UNIT III  COCKPIT DISPLAYS AND MAN-MACHINE INTERACTION  9
Trends in display technology— CRT, LED, LCD, EL and plasma panel - Touch screen - Direct voice input (DVI) —Civil cockpit and military cockpit: MFD, MFK, HUD, HDD, HMD, HOTAS — Glass cockpit.
UNIT IV                      FLIGHT CONTROL SYSTEMS


UNIT V                       NAVIGATION SYSTEMS


COURSE OUTCOMES:            TOTAL: 45 PERIODS

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

**CO1:** Explain the different of Avionics Systems and its need for civil and military aircrafts considering the reliability and safety aspects

**CO2:** Select a suitable architecture and data bus based on the requirements

**CO3:** Compare the different display technologies used in cockpit

**CO4:** Explain the principles of flight control systems and the importance of FMS

**CO5:** Explain the communication and navigation techniques used in aircrafts

TEXT BOOK:


REFERENCES:


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COURSE OBJECTIVES:
- To learn the fundamentals of low power low voltage VLSI design.
- To understand the impact of power on system performances.
- To understand the different design approaches.
- To develop the low power low voltage memories

UNIT I FUNDAMENTALS OF LOW POWER CIRCUITS 6

UNIT II LOW-POWER DESIGN APPROACHES 6

UNIT III LOW-VOLTAGE LOW-POWER ADDERS 6

UNIT IV LOW-VOLTAGE LOW-POWER MULTIPLIERS 6
Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier

UNIT V LOW-VOLTAGE LOW-POWER MEMORIES 6

30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Modeling and sources of power consumption
2. Power estimation at different design levels (mainly circuit, transistor, and gate)
3. Power optimization for combinational circuits
4. Power optimization for sequential circuits
5. Power optimization for RT and algorithmic levels.

TOTAL:60 PERIODS
COURSE OUTCOMES:
Upon successful completion of the course the student will be able to

CO1: Understand the fundamentals of Low power circuit design.
CO2: Attain the knowledge of architectural approaches.
CO3: Analyze and design Low-Voltage Low-Power combinational circuits.
CO4: Learn the design of Low-Voltage Low-Power Memories
CO5: Design and develop Low Power, Low Voltage Circuits

TEXT BOOKS:

REFERENCES

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COURSE OBJECTIVES:
- To introduce the basic concepts of antenna arrays for smart antenna design
- To discuss the random variables and processes for angle of arrival (AOA) estimation
- To describe different algorithms used for AOA estimation
- To introduce the concepts of fixed weight beamforming
- To introduce the concept of adaptive beamforming

UNIT I  ANTELLA ARRAY FUNDAMENTALS  6

UNIT II  PRINCIPLES OF RANDOM VARIABLES AND PROCESSES  6

UNIT III  ANGLE OF ARRIVAL ESTIMATION  6

UNIT IV  SMART ANTENNAS: FIXED WEIGHT BEAMFORMING  6
Introduction - Historical Development of Smart Antennas - Fixed Weight Beamforming Basics: Maximum signal-to-interference ratio, Minimum mean-square error, Maximum likelihood, Minimum variance

UNIT V  SMART ANTENNAS: ADAPTIVE BEAMFORMING  6
Adaptive Beamforming: Least mean squares, Sample matrix inversion, Recursive least squares, Constant modulus, Least squares constant modulus, Conjugate gradient method, Spreading sequence array weights, Description of the new SDMA receiver.

PRACTICAL EXERCISES:  30 PERIODS
1. Write a MATLAB code to estimate the radiation pattern of a linear array and N element uniform array
2. Write a MATLAB code to estimate the AOA using MUSIC and ESPRIT algorithm
3. Write a MATLAB code to estimate the weights of the array. Using the final weights estimate the array factor and the mean square error.
4. Write a MATLAB code to dynamically alter the main lobe direction based on the information of AOA.

COURSE OUTCOMES:
At the end of this course, the students will be able to:

CO1: Describe the basics of phased array antennas
CO2: Understand random process and its application in Smart antennas
CO3: Estimate the weights of the antenna array based on the angle of arrival
CO4: Analyze the fixed weight beamforming in smart antennas
CO5: Analyze adaptive beamforming in smart antennas

TOTAL 60 PERIODS

TEXT BOOKS

REFERENCES
3. Thomas Kaiser, Smart Antennas: State of the Art, Hindawi, 2005

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PTCEC365
WIRELESS SENSOR NETWORK DESIGN

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COURSE OBJECTIVES:
- To understand the fundamentals of wireless sensor network
- To gain knowledge on the MAC and Routing Protocols of WSN
- To get exposed to 6LOWPAN technology
- To acquire knowledge on the protocols required for developing real time applications using WSN and 6LOWPAN.
- To gain knowledge about operating system related to WSN and 6LOWPAN
# UNIT I INTRODUCTION

Principle of Wireless Sensor Network - Introduction to wireless sensor networks - Challenges, Comparison with ad hoc network, Node architecture and Network architecture, design principles, Service interfaces, Gateway, Short range radio communication standards - IEEE 802.15.4, Zigbee and Bluetooth. Physical layer and transceiver design considerations.

# UNIT II MAC AND ROUTING PROTOCOLS

MAC protocols – fundamentals, low duty cycle protocols and wakeup concepts, contention and Schedule-based protocols - SMAC, BMAC, TRAMA, Routing protocols – Requirements, Classification - SPIN, Directed Diffusion, COUGAR, ACQUIRE, LEACH, PEGASIS.

# UNIT III 6LOWPAN


# UNIT IV APPLICATION

Design Issues, Protocol Paradigms - End-to-end, Real-time streaming and sessions, Publish/subscribe, Web service paradigms, Common Protocols - Web service protocols, MQTT telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol (CAP), Service discovery, Simple network management protocol (SNMP), Real-time transport and sessions, Industry- Specific protocols.

# UNIT V TOOLS

TinyOS – Introduction, NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, TOSSIM, Contiki – Structure, Communication Stack, Simulation environment – Cooja simulator, Programming

**TOTAL: 45 PERIODS**

**COURSE OUTCOMES:**

CO1: To be able to design solutions for WSNs applications  
CO2: To be able to develop efficient MAC and Routing Protocols  
CO3: To be able to design solutions for 6LOWPAN applications  
CO4: To be able to develop efficient layered protocols in 6LOWPAN  
CO5: To be able to use Tiny OS and Contiki OS in WSNs and 6LOWPAN applications

**REFERENCES:**

CO’s-PO’s & PSO’s MAPPING

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PTCEC331 4G / 5G COMMUNICATION NETWORKS L T P C
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COURSE OBJECTIVES
- To learn the evolution of wireless networks.
- To get acquainted with the fundamentals of 5G networks.
- To study the processes associated with 5G architecture.
- To study spectrum sharing and spectrum trading.
- To learn the security features in 5G networks.

UNIT I EVOLUTION OF WIRELESS NETWORKS 6

UNIT II 5G CONCEPTS AND CHALLENGES 6
Fundamentals of 5G technologies, overview of 5G core network architecture, 5G new radio and cloud technologies, Radio Access Technologies (RATs), EPC for 5G.

UNIT III NETWORK ARCHITECTURE AND THE PROCESSES 6
5G architecture and core, network slicing, multi access edge computing (MEC) visualization of 5G components, end-to-end system architecture, service continuity, relation to EPC, and edge computing. 5G protocols: 5G NAS, NGAP, GTP-U, IPSec and GRE.

UNIT IV DYNAMIC SPECTRUM MANAGEMENT AND MM WAVES 6
Mobility management, Command and control, spectrum sharing and spectrum trading, cognitive radio based on 5G, millimeter waves.

UNIT V SECURITY IN 5G NETWORKS 6
Security features in 5G networks, network domain security, user domain security, flow based QoS framework, mitigating the threats in 5G.
PRACTICAL EXERCISES: 30 PERIODS
SIMULATION USING MATLAB 30 PERIODS

1. 5G-Compliant waveform generation and testing
2. Modeling of 5G Synchronization signal blocks and bursts
3. Channel modeling in 5G networks
4. Multiband OFDM demodulation
5. Perfect Channel estimation

COURSE OUTCOMES

CO1: To understand the evolution of wireless networks.
CO2: To learn the concepts of 5G networks.
CO3: To comprehend the 5G architecture and protocols.
CO4: To understand the dynamic spectrum management.
CO5: To learn the security aspects in 5G networks.

TOTAL 60 PERIODS

TEXT BOOKS

1. 5G Core networks: Powering Digitalization, Stephen Rommer, Academic Press, 2019

REFERENCES

1. 5G Simplified: ABCs of Advanced Mobile Communications, Jyrki. T.J. Penttinen, Copyrighted Material.

CO's-PO's & PSO's MAPPING

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COURSE OBJECTIVES:

- To understand the basic electrical and mechanical concepts of MEMS design
- To understand the design aspects of electrostatic sensors and actuators
- To understand the design aspects of thermal sensors and actuators
- To understand the design aspects of piezoelectric sensors and actuators
- To understand the design aspects of magnetic sensors and actuators

UNIT I ESSENTIAL ELECTRIC AND MECHANICAL CONCEPTS 6

Conductivity of semiconductors, Crystal planes and orientations, stress and strain, flexural beam bending analysis under simple loading conditions, Dynamic system, resonant frequency and quality factor

UNIT II ELECTRO STATIC SENSING AND ACTUATION 6

Parallel plate capacitor, Applications of parallel plate capacitors- inertial sensor, pressure sensor, flow sensor, tactile sensor, parallel plate actuators, interdigitated finger capacitors, applications of comb drive devices.

UNIT III THERMAL SENSING AND ACTUATION 6

Fundamentals of thermal transfer, Sensors and actuators based on thermal expansion, Thermal couples, Thermal resistors, Applications- Infrared sensors, flow sensors, Inertial sensors, other sensors

UNIT IV PIEZOELECTRIC SENSING AND ACTUATION 6

Mathematical description of piezoelectric effects, Cantilever piezoelectric actuator model, properties of piezoelectric materials –Quartz, PZT, PVDF, ZnO, Applications – Acoustic sensors, Tactile sensors

UNIT V MAGNETIC SENSING AND ACTUATION 6

Concepts and principles- magnetization and nomenclatures, principles of micromagnetic actuators, fabrication of micro magnetic components- deposition, design and fabrication of magnetic coil, MEMS magnetic actuators

PRACTICAL EXERCISES: 30 PERIODS

1. Design and simulation of piezoelectric cantilever
2. Design and simulation of thermo couples
3. Design and simulation of comb drive actuators

COURSE OUTCOMES:

Upon completion of this course, the students will be able to

CO1: Understand the basics of MEMS design aspects.

CO2: Apply the knowledge in the development of electro static sensors and actuators.
CO3: Apply the knowledge in the development of thermal sensors and actuators.
CO4: Apply the knowledge in the development of piezoelectric sensors and actuators.
CO5: Apply the knowledge in the development of magnetic sensors and actuators.

TOTAL: 60 PERIODS

TEXTBOOKS

REFERENCES
3. Tai Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata Mcgraw Hill, 2002

CO’s-PO’s & PSO’s MAPPING

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PTCEC355 SOFTWARE DEFINED RADIO

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COURSE OBJECTIVES:
- To introduce the concepts of software radios
- To know about RF implementation challenges for software defined radios
- To understand the digital generation of signals
- To learn the software and hardware requirements for software defined radios.

UNIT I INTRODUCTION TO SOFTWARE RADIO


UNIT II RF IMPLEMENTATION

Purpose of RF front – end, Dynamic range, RF receiver front – end topologies, Enhanced flexibility of the RF chain with software radios, Importance of the components to overall...
performance, Transmitter architectures and their issues, Noise and distortion in the RF chain, Hybrid DDS – PLL systems, Applications of Direct Digital Synthesis.

UNIT III  DIGITAL GENERATION OF SIGNALS  6

Comparison of direct digital synthesis with analog signal synthesis, Approaches to direct digital synthesis, Analysis of spurious signals, Performance of direct digital synthesis systems, Applications of direct digital synthesis.

UNIT IV  SMART ANTENNAS  6

Benefits of smart antennas, Structures for beamforming systems, Smart antenna algorithms, Hardware implementation of smart antennas, Digital Hardware Choices-Key hardware elements.

UNIT V  HARDWARE AND SOFTWARE FOR SDR & CASE STUDIES  6

DSP Processors, FPGA, ASICs. Trade-offs, Object oriented programming, Object Brokers, GNU Radio-USRP. Case Studies: SPEAK easy, JRTS, SDR-3000.

PRACTICAL EXERCISES:  30 PERIODS

1. Study of SDR hardware kit
2. Design and Implementation of digital modulation schemes using SDR
3. Implementation of synchronization techniques using SDR
4. Channel Coding Techniques using SDR
5. Study of channel estimation techniques using SDR
6. Study of MIMO concepts using SDR

COURSE OUTCOMES:
At the end of this course, the students will be able to:

CO1: Demonstrate an understanding in the evolving paradigm of Software defined radio and technologies for its implementation.
CO2: Analyse Radio frequency implementation issues
CO3: Implement Smart antenna techniques for software defined radio.
CO4: Compare various digital synthesis procedures.
CO5: Comprehend various hardware and software requirements for software defined radios.

TOTAL:60 PERIODS

TEXT BOOKS:


REFERENCES:


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PTCEC352 SATELLITE COMMUNICATION L T P C 3 0 0 3

COURSE OBJECTIVES:
The student should be made to:

- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Understand Link Power budget calculation
- Understand the various satellite access and coding technology
- Understand the applications of satellite

UNIT I SATELLITE ORBITS

UNIT II SPACE SEGMENT
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders Antenna Subsystem.

UNIT III SATELLITE LINK DESIGN
Basic link analysis, Uplink and Downlink Design equation, Free space loss-Atmospheric effects, Ionospheric scintillation, Rain induced attenuation and interference, system noise temperature, Link Design with and without frequency reuse.

UNIT IV SATELLITE ACCESS AND CODINGTechniques
UNIT V  SATELLITE APPLICATIONS

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, LEO, MEO, Satellite Navigational System. GPS-Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

TOTAL:45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student will be able to:
CO1: Identify the satellite orbits
CO2: Analyze the satellite subsystems
CO3: Evaluate the satellite link power budget
CO4: Identify access technology for satellite
CO5: Design various satellite applications

TEXT BOOKS:

REFERENCES:

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PTCEC368  IOT BASED SYSTEMS DESIGN  L T P C
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COURSE OBJECTIVES:
- To understand the basics of IoT.
- To get knowledge about the various services provided by IoT.
- To familiarize themselves with various communication techniques and networking.
- To know the implementation of IoT with different tools.
- To understand the various applications in IoT.

UNIT I  INTRODUCTION TO INTERNET OF THINGS  9

UNIT II  MIDDLEWARE AND PROTOCOLS OF IOT  9

UNIT III  COMMUNICATION AND NETWORKING  9
IoT 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 LoRaWAN – 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 - Data aggregation & dissemination.

UNIT IV  IOT IMPLEMENTATION TOOLS  9
Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python, Implementation of IoT with Raspberry Pi.

UNIT V  APPLICATIONS AND CASE STUDIES:  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to
CO1: Articulate the main concepts, key technologies, strength and limitations of IoT.
CO2: Identify the architecture, infrastructure models of IoT.
CO3: Analyze the networking and how the sensors are communicated in IoT.
CO4: Analyze and design different models for IoT implementation.
CO5: Identify and design the new models for market strategic interaction.

TEXT BOOKS:

REFERENCES:

CO’s-PO’s & PSO’s MAPPING

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PTCEC334 ANALOG IC DESIGN
L T P C 2 0 2 3

COURSE OBJECTIVES:
- To study the basics of MOS Circuits.
- To analyse the noise characteristics of amplifiers.
- To study the performance parameters of amplifiers.
- To comprehend the compensation techniques
- To understand the detection and testing of faults.

UNIT I SINGLE STAGE AMPLIFIERS
Basic MOS physics and equivalent circuits and models, CS, CG and Source Follower, differential amplifier with active load, Cascode and Folded Cascode configurations with active
load, design of Differential and Cascode Amplifiers – to meet specified SR, noise, gain, BW, ICMR and power dissipation, voltage swing, high gain amplifier structures.

UNIT II HIGH FREQUENCY AND NOISE CHARACTERISTICS OF AMPLIFIERS
Miller effect, association of poles with nodes, frequency response of CS, CG and Source Follower, Cascode and Differential Amplifier stages, statistical characteristics of noise, noise in Single Stage amplifiers, noise in Differential Amplifiers.

UNIT III FEEDBACK AND SINGLE STAGE OPERATIONAL AMPLIFIERS
Properties and types of negative feedback circuits, effect of loading in feedback networks, operational amplifier performance parameters, single stage Op Amps, two-stage Op Amps, input range limitations, gain boosting, slew rate, power supply rejection, noise in Op Amps.

UNIT IV STABILITY, FREQUENCY COMPENSATION
Multipole Systems, Phase Margin, Frequency Compensation, Compensation Of Two Stage Op Amps, Slewing In Two Stage Op Amps, Other Compensation Techniques.

UNIT V LOGIC CIRCUIT TESTING

PRACTICAL EXERCISES:
1. Design a CMOS inverter and analyze its characteristics.
2. Design a Common source amplifier and analyze its performance.
3. Design a Common drain amplifier and analyze its performance.
4. Design a Common gate amplifier and analyze its performance.
5. Design a differential amplifier with resistive load using transistors.
6. Design three stage and five stage ring oscillator circuit and compare its frequencies.

List of equipment needed for a batch of 30 students (3 in a bench):
- Cadence/Tanner/equivalent EDA Tools -10 User License

COURSE OUTCOMES:
Upon successful completion of the course the student will be able to:
CO1: Design amplifiers to meet user specifications.
CO2: Analyse the frequency and noise performance of amplifiers.
CO3: Design and analyse feedback amplifiers and one stage op amps.
CO4: Analyse stability of op amp.
CO5: Testing experience of logic circuits.

TEXTBOOKS:

REFERENCES:
3. Recorded Lecture Available at http://www.ee.iitm.ac.in/vlsi/courses/ee5320_2021/start

CO’s-PO’s & PSO’s MAPPING

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PTCCS338 COMPUTER VISION L T P C 2 0 2 3

COURSE OBJECTIVES:
- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

UNIT I INTRODUCTION TO IMAGE FORMATION AND PROCESSING 6

UNIT II FEATURE DETECTION, MATCHING AND SEGMENTATION 6
Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 6
2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment -

UNIT IV  3D RECONSTRUCTION  6
Shape from X - Active rangefinding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

UNIT V  IMAGE-BASED RENDERING AND RECOGNITION  6

PRACTICAL EXERCISES: 30 PERIODS
LABORATORY EXPERIMENTS: 30 PERIODS
Software needed:
OpenCV computer vision Library for OpenCV in Python / PyCharm or C++ / Visual Studio or or equivalent

- OpenCV Installation and working with Python
- Basic Image Processing - loading images, Cropping, Resizing, Thresholding, Contour analysis, Bolb detection
- Image Annotation – Drawing lines, text circle, rectangle, ellipse on images
- Image Enhancement - Understanding Color spaces, color space conversion, Histogram equalization, Convolution, Image smoothing, Gradients, Edge Detection
- Image Features and Image Alignment – Image transforms – Fourier, Hough, Extract ORB Image features, Feature matching, cloning, Feature matching based image alignment
- Image segmentation using Graphcut / Grabcut
- Camera Calibration with circular grid
- Pose Estimation
- 3D Reconstruction – Creating Depth map from stereo images
- Object Detection and Tracking using Kalman Filter, Camshift

1. docs.opencv.org
2. https://opencv.org/opencv-free-course/

TOTAL : 60 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to:
CO1: To understand basic knowledge, theories and methods in image processing and computer vision.
CO2: To implement basic and some advanced image processing techniques in OpenCV.

CO3: To apply 2D a feature-based based image alignment, segmentation and motion estimations.

CO4: To apply 3D image reconstruction techniques

CO5: To design and develop innovative image processing and computer vision applications.

TEXT BOOKS:

REFERENCES:
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006

CO’s- PO’s & PSO’s MAPPING

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SOFT CORE – MANAGEMENT

PTGE3751 PRINCIPLES OF MANAGEMENT

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COURSE OBJECTIVES:
- Sketch the Evolution of Management.
- Extract the functions and principles of management.
- Learn the application of the principles in an organization.
- Study the various HR related activities.
• Analyze the position of self and company goals towards business.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

UNIT II PLANNING 9

UNIT III ORGANISING 9

UNIT IV DIRECTING 9

UNIT V CONTROLLING 9
System and process of controlling – Budgetary and non - Budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling.
CO2: Have same basic knowledge on international aspect of management.
CO3: Ability to understand management concept of organizing.
CO4: Ability to understand management concept of directing.
CO5: Ability to understand management concept of controlling.

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PTGE3752 TOTAL QUALITY MANAGEMENT L T P C
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COURSE OBJECTIVES:
- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION 9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Definition of TQM - Basic concepts of TQM - Gurus of TQM (Brief introduction) - TQM Framework - Barriers to TQM - Benefits of TQM.

UNIT II TQM PRINCIPLES 9
Continuous process improvement – Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III  TQM TOOLS & TECHNIQUES I


UNIT IV  TQM TOOLS & TECHNIQUES II

Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures - Cost of Quality - BPR.

UNIT V  QUALITY MANAGEMENT SYSTEM


TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Ability to apply TQM concepts in a selected enterprise.
CO2: Ability to apply TQM principles in a selected enterprise.
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
CO4: Ability to understand Taguchi’s Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.
CO5: Ability to apply QMS and EMS in any organization.

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TEXT BOOK:
1. Dale H.Besterfield, Carol B.Michna, Glen H. Besterfield, Mary B. Sacre,
REFERENCES:

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COURSE OBJECTIVES:
- Understanding the concept of Engineering Economics.
- Implement various micro economics concept in real life.
- Gaining knowledge in the field of macro economics to enable the students to have better understanding of various components of macro economics.
- Understanding the different procedures of pricing.
- Learn the various cost related concepts in micro economics.

UNIT I DEMAND & SUPPLY ANALYSIS
Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis. Demand - Types of demand - Determinants of demand - Demand function - Demand elasticity - Demand forecasting - Supply - Determinants of supply - Supply function - Supply elasticity.

UNIT II PRODUCTION AND COST ANALYSIS

UNIT III PRICING
Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice.

UNIT IV FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT)
Balance sheet and related concepts - Profit & Loss Statement and related concepts - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis - Comparative financial statements - Analysis & Interpretation of financial statements.
UNIT V  CAPITAL BUDGETING (ELEMENTARY TREATMENT)

Investments - Risks and return evaluation of investment decision - Average rate of return
- Payback Period - Net Present Value - Internal rate of return.

TOTAL: 45 PERIODS

COURSE OUTCOMES: Students able to

CO1: Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions

CO2: Evaluate the economic theories, cost concepts and pricing policies

CO3: Understand the market structures and integration concepts

CO4: Understand the measures of national income, the functions of banks and concepts of globalization

CO5: Apply the concepts of financial management for project appraisal

TEXT BOOKS:


REFERENCES:

5. Dr. S. N. Maheswari and Dr. S.K. Maheshwari: Financial Accounting, Vikas, 2009

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COURSE OBJECTIVE:
- To provide knowledge about management issues related to staffing,
- To provide knowledge about management issues related to training,
- To provide knowledge about management issues related to performance
- To provide knowledge about management issues related to compensation
- To provide knowledge about management issues related to human factors consideration and compliance with human resource requirements.

UNIT I INTRODUCTION TO HUMAN RESOURCE MANAGEMENT

UNIT II HUMAN RESOURCE PLANNING

UNIT III TRAINING AND EXECUTIVE DEVELOPMENT
Types of training and Executive development methods – purpose – benefits.

UNIT IV EMPLOYEE COMPENSATION

UNIT V PERFORMANCE EVALUATION AND CONTROL

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Students would have gained knowledge on the various aspects of HRM
CO2: Students will gain knowledge needed for success as a human resources professional.
CO3: Students will develop the skills needed for a successful HR manager.
CO4: Students would be prepared to implement the concepts learned in the workplace.
CO5: Students would be aware of the emerging concepts in the field of HRM

TEXT BOOKS:
REFERENCES:

CO’s- PO’s & PSO’s MAPPING

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PTGE3755 KNOWLEDGE MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES:
The student should be made to:
- Learn the Evolution of Knowledge management.
- Be familiar with tools.
- Be exposed to Applications.
- Be familiar with some case studies.

UNIT I INTRODUCTION
Introduction: An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.

UNIT II CREATING THE CULTURE OF LEARNING AND KNOWLEDGE SHARING

UNIT III KNOWLEDGE MANAGEMENT-THE TOOLS
Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management -
Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval - Information Coding in the Internet Environment - Repackaging Information.

UNIT IV  KNOWLEDGE MANAGEMENT APPLICATION  9
Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

UNIT V  FUTURE TRENDS AND CASE STUDIES  9
Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life-cycles of an organization.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the student should be able to:
CO1: Understand the process of acquirey knowledge from experts
CO2: Understand the learning organization.
CO3: Use the knowledge management tools.
CO4: Develop knowledge management Applications.
CO5: Design and develop enterprise applications.

CO’s- PO’s & PSO’s MAPPING

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TEXT BOOK:

REFERENCE:
COURSE OBJECTIVES

- To study the basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
- To study the planning; organizing and staffing functions of management in professional organization.
- To study the leading; controlling and decision making functions of management in professional organization.
- To learn the organizational theory in professional organization.
- To learn the principles of productivity and modern concepts in management in professional organization.

UNIT – I INTRODUCTION TO MANAGEMENT

Management: Introduction; Definition and Functions – Approaches to the study of Management – Mintzberg’s Ten Managerial Roles – Principles of Taylor; Fayol; Weber; Parker – Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative – Public Sector Vs Private Sector Organization – Business Environment: Economic; Social; Political; Legal – Trade Union: Definition; Functions; Merits & Demerits.

UNIT – II FUNCTIONS OF MANAGEMENT - I

Planning: Characteristics; Nature; Importance; Steps; Limitation; Planning Premises; Strategic Planning; Vision & Mission statement in Planning– Organizing: Organizing Theory; Principles; Types; Departmentalization; Centralization and Decentralization; Authority & Responsibility – Staffing: Systems Approach; Recruiting and Selection Process; Human Resource Development (HRD) Concept and Design.

UNIT – III FUNCTIONS OF MANAGEMENT - II

Directing (Leading): Leadership Traits; Style; Morale; Managerial Grids (Blake-Mounton, Reddin) – Communication: Purpose; Model; Barriers – Controlling: Process; Types; Levels; Guidelines; Audit (External, Internal, Merits); Preventive Control – Decision Making: Elements; Characteristics; Nature; Process; Classifications.

UNIT – IV ORGANIZATION THEORY

Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management – Maslow’s hierarchy of needs theory; Herzberg’s motivation-hygiene theory; McClelland’s three needs motivation theory; Vroom’s valence-expectancy theory – Change Management: Concept of Change; Lewin’s Process of Change Model; Sources of Resistance; Overcoming Resistance; Guidelines to managing Conflict.

UNIT – V PRODUCTIVITY AND MODERN TOPICS

Productivity: Concept; Measurements; Affecting Factors; Methods to Improve – Modern Topics (concept, feature/characteristics, procedure, merits and demerits): Business Process
Reengineering (BPR); Benchmarking; SWOT/SWOC Analysis; Total Productive Maintenance; Enterprise Resource Planning (ERP); Management of Information Systems (MIS).

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the students would be able to

**CO1** Explain basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.

**CO2** Discuss the planning; organizing and staffing functions of management in professional organization.

**CO3** Apply the leading; controlling and decision making functions of management in professional organization.

**CO4** Discuss the organizational theory in professional organization.

**CO5** Apply principles of productivity and modern concepts in management in professional organization.

TEXTBOOKS:


REFERENCES: