ANNAMALAI UNIVERSITY

Faculty of Engineering and Technology

Department of Electronics and Communication Engineering

B.E. Electronics and Communication Engineering
Four Year Degree Programme
Choice Based Credit System
(Full - Time)

Revised Regulations & Syllabi

(Students Admitted From the Academic Year 2018-2019)
VISION
To provide innovative, creative and technically competent Electronic and Communication Engineers for industry and society through excellence in Technical Education and Research.

MISSION
To provide quality education in the field of Electronics and Communication Engineering through periodically updating curriculum, effective teaching-learning process, best laboratory facilities and collaborative ventures with the industries.

To inculcate innovative skills, research aptitude, team-work, ethical practices among students so as to meet out expectations of the industry as well as society.

To adopt the best educational methods to improve teaching learning process continuously.

To provide students with hands on training on latest technology with supporting software.

To facilitate effective interactions among faculty and students, and foster networking with alumni, industries and other reputed institutions.

B.E.(ECE)-PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

<table>
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<tr>
<th>S.No.</th>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
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<tbody>
<tr>
<td><strong>PEO1</strong></td>
<td>To prepare students to excel in undergraduate Programme and to succeed in industry / technical profession through quality education.</td>
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<tr>
<td><strong>PEO2</strong></td>
<td>To provide students with solid foundation in mathematics, basic science and engineering fundamentals necessary to analyze, formulate and solve problems in the field of Electronics and Communication engineering.</td>
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<tr>
<td><strong>PEO3</strong></td>
<td>To inculcate a strong flavour of project activities among the students and impart them with good scientific and engineering knowledge including proficiency in hardware languages, use of latest software tools, so as to analyze, design and create novel products and provide solutions to real life problems.</td>
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<tr>
<td><strong>PEO4</strong></td>
<td>To impart the professional and ethical attitude, effective communication and presentation skills, teamwork skills, multidisciplinary approach, and an ability to integrate engineering issues to broader social contexts to students.</td>
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<tr>
<td><strong>PEO5</strong></td>
<td>To provide student with an academic environment aware of excellence, outstanding leadership, written ethical codes and guidelines with moral values, and the life-long learning needed for a successful professional career.</td>
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<td>S.No</td>
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<tr>
<td>PO1</td>
<td><strong>Engineering Knowledge</strong></td>
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<td>Apply the knowledge of mathematics, basic science and engineering fundamentals in finding solutions to complex problems in the field of electronics and communication engineering.</td>
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<td>PO2</td>
<td><strong>Problem Analysis</strong></td>
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<td>Analyze the problem identify and formulate the computing requirements appropriate to its solutions.</td>
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<td>PO3</td>
<td><strong>Design/development of Solutions</strong></td>
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<td>Capable of designing a system component or process that meet specific needs with appropriate considerations for health, safety, societal and environmental issues.</td>
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<td>PO4</td>
<td><strong>Conduct investigations of complex problems:</strong></td>
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<td>Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. Design and conduct experiment as well as to analyze and interpret data.</td>
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<td>PO5</td>
<td><strong>Modern tool usage:</strong></td>
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<td>Use latest simulation tools current techniques Software and Hardware skills for analyzing and obtaining solutions to engineering problems.</td>
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<td>PO6</td>
<td><strong>The engineer and society:</strong></td>
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<td>Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.</td>
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<td>PO7</td>
<td><strong>Environment and sustainability:</strong></td>
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<td>Possess adequate knowledge required for sustainable development keeping in view of environmental impacts and contemporary issues.</td>
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<td><strong>Ethics:</strong></td>
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<td>Acquire strong ethical and professional responsibilities adherence to quality and abide rules and regulations of eminent organizations or industries.</td>
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<td>PO9</td>
<td><strong>Individual and Team work:</strong></td>
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<td>Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.</td>
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<td><strong>Communication:</strong></td>
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<td>Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.</td>
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<td>PO11</td>
<td><strong>Project management and Finance:</strong></td>
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<td>Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multi disciplinary environments.</td>
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<td><strong>Life-Long learning:</strong></td>
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<td>Engage in self education and lifelong learning.</td>
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### B.E.(ECE)-MAPPING OF PO WITH PEO

#### MAPPING OF PO WITH PEO

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Students must undertake Internship for 4 weeks during summer vacation which will be assessed in the forthcoming III Semester.
### SEMESTER III

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*For the Lateral entry students total credit for III Semester is 23.5 as they are exempted from internship during summer vacation of II semester.*

**Four weeks during the summer vacation at the end of II Semester**

### Total Credits 27.5

### SEMESTER IV

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**Total Credits 21.5**

Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming V Semester.
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| Total Credits | **26.5** |

### SEMESTER VI

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| Total Credits | **21.0** |

Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming VII Semester.
### SEMESTER VII

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Total Credits 19.5

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Total Credits 12

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COURSE OBJECTIVES

- To learn partial and differential equations, Fourier series, Boundary value problems.
- To learn the transforms such as Sine, Cosine, Fourier transform and Z transforms
- To gain Knowledge of the method to find the solution of difference Method.

UNIT I
Partial Differential Equations


UNIT II
Fourier Series


UNIT III
Boundary Value Problems

Solutions of One Dimensional Wave Equation - One Dimensional Heat Equation (Without Derivation) - Fourier Series Solutions in Cartesian Co-Ordinates.

UNIT IV
Fourier Transform

Fourier Integral Theorem (Without Proof) - Fourier Transform Pair- Sine and Cosine Transforms - Properties - Transforms of Simple Functions – Convolution Theorem - Parseval’s Identity.

UNIT V
Z-Transform and Difference Equations


TEXT BOOKS

REFERENCES
COURSE OUTCOMES
At the end of the course the students will be able to acquire knowledge on
1. Be capable of mathematically formulating certain practical problems in terms of partial differential equation. Solve them and physically interpret the results.
2. Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical Fourier analysis that an engineer may have to make from discrete data.
3. Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
4. Have grasped to concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.
5. Have learnt the basics of z-transform in its applicability to discretely varying functions. gained the skill to formulate certain problems in terms of difference equations and solve them using the z-transform techniques bringing out the elegance of the procedure involved.

Mapping with Programme Outcomes (POs)

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COURSE OBJECTIVES
- To realize the importance of environment for engineering students.
- To understand the basis of ecosystems
- To make aware the student about global environmental problems and natural disasters.
- To give the ideas about advance technologies of Engineering that will useful to protect environment.

UNIT I
Introduction
Multidisciplinary nature of environmental studies - Definition, scope and importance - Need for public awareness.

Natural resources - Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using
mineral resources, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

UNIT II
Ecosystem
Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological - pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT III
Diversity

UNIT IV
Pollution
Definition - Cause, effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution- Noise pollution - Thermal pollution - Nuclear hazards- Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster management: floods, earthquake, cyclone and landslides. Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, and watershed management - Resettlement and rehabilitation of people; its problems and concerns. - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.


UNIT V
Social Welfare
Field Work
Visit to a local area to document environmental assets river / forest / grassland / hill / mountain - Visit to a local polluted site - Urban / Rural / Industrial / Agricultural - Study of common plants, insects, birds - Study of simple ecosystems- pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

TEXT BOOKS
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R).

REFERENCES
2. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
7. Survey of the Environment, The Hindu (M)

(M) MAGAZINE  (R) REFERENCE  (TB) TEXTBOOK

COURSE OUTCOMES
At the end students can able to
1. Understand the importance of environment.
2. Analyze the importance of environment in engineering.
3. Apply their own ideas and demonstrate advanced technologies that will be useful to protect environment.
4. Employ awareness among the society about environmental problems and natural disasters.
5. Practice according to the present and future environmental issues.

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COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To enable them to write algorithms for solving problems with the help of fundamental data structures

UNIT I
Introduction
Basic Terminologies: Elementary Data Organizations, Data Structure
Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic
Notations, Time-Space trade off. Searching: Linear Search and Binary Search
Techniques and their complexity analysis.

UNIT II
Stacks and Queues
DT Stack and its operations: Algorithms and their complexity analysis,
Applications of Stacks: Expression Conversion and evaluation – corresponding
algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue,
Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms
and their analysis.

UNIT III
Linked Lists
Singly linked lists: Representation in memory, Algorithms of several
operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked
representation of Stack and Queue, Header nodes, Doubly linked list: operations on
it and algorithmic analysis; Circular Linked Lists: all operations their algorithms
and the complexity analysis.

UNIT IV
Trees
Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded
Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and
their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+
Tree: definitions, algorithms and analysis.

UNIT V
Sorting and Hashing
Objective and properties of different sorting algorithms: Selection Sort, Bubble
Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and
Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal
algorithms and complexity analysis

TEXT BOOKS
REFERENCES
2. R.G. Dromey, "How to Solve it by Computer", 2nd Impression by Pearson Education.

COURSE OUTCOMES
Student will be able
1. For a given algorithm student will be able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will be able to implement it.
3. For a given problem of Stacks, Queues and linked list student will be able to implement it and analyze the same to determine the time and computation complexity.
4. To write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. To implement Graph search and traversal algorithms and determine the time and computation complexity.

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ECES304 | BASIC ELECTRONICS | L | T | P | C |
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COURSE OBJECTIVES
- To gain a basic knowledge on Active and passive components
- To learn the principles of diodes and transistors suitable for various applications
- To gain a basic knowledge on characteristics of transistors.
- To learn the concepts of analog devices

UNIT I
P-N Junction Diode
UNIT II
Rectifiers, Regulators and Special Semiconductor Devices
Analysis of half wave Rectifier, Full wave Rectifiers: Centre tap and Bridge rectifiers without filters and with C, L and LC filters –series and shunt voltage regulators –Special Semiconductor devices: Principle of Operation and Characteristics of Schottky diode, Tunnel Diode ,Varactor Diode, SCR and Semiconductor Photo Diodes and UJT.

UNIT III
Bipolar Junction Transistor

UNIT IV
Transistor Biasing and Stabilization
Operating Point, the DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector - Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in VBE and $\beta$ , Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability.

UNIT V
Field Effect Transistor

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completion of this course the students will have
1. Acquired knowledge on basic semiconductor theory.
2. Acquired knowledge on characteristics of PN junction diode and its applications.
3. Understand the characteristics and working of BJTs and FETs
4. Ability to design biasing circuits for BJTs and JFETs
5. Understand the applications of transistors.
### COURSE OBJECTIVES

- To prepare the students to have a basic knowledge in analyze of electric networks.
- To study various network theorems and solving methods.
- To give basic knowledge of Trigonometric and exponential Fourier series.
- To study resonant circuits and properties of Laplace transforms.
- To analyze various three phase circuits, star and delta connections.

### UNIT I
**DC and AC Circuits**


### UNIT II
**Network theorems**

Superposition, reciprocity, Thevenin’s, Norton’s, Maximum power Transfer, compensation and Tallegen’s theorem as applied to AC circuits.

### UNIT III
**Steady state and Transient Analysis**

Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values – Fourier transform and continuous spectra. (Steady state sinusoidal analysis using Phasor)

Laplace transforms and properties: Partial fractions – singularity functions – waveform synthesis – analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions – Transient behavior – concept of complex frequency
UNIT IV
Network Functions


UNIT V
Frequency Domain Application

Two port network and interconnections – parameters- Behaviours of series and parallel resonant circuits. Design of constant-k low pass, high pass, band pass and band reject filters.

TEXT BOOKS
1. Van, Valkenburg.; "Network analysis"; Prentice hall of India, 2000

REFERENCES

COURSE OUTCOMES
At the end of this course students will demonstrate the ability to
1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.

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COURSE OBJECTIVES

- To introduce Number systems and arithmetic operations on binary numbers.
- To introduce basic postulates of Boolean algebra, Boolean functions and methods to simplify Boolean expressions.
- To acquire knowledge on design and analysis of combinational circuits using PLDs.
- To understand the realization of combination circuits To outline the procedures for analysis and design of synchronous and asynchronous sequential circuits.
- To introduce different logic families, semiconductor memories and related technology.

UNIT I
Introduction


UNIT II
Combinational Logic and PLDs


UNIT III
Synchronous Sequential Logic


UNIT IV
Asynchronous Sequential Logic

UNIT V
Digital Logic Families and Semiconductor Memories

Characteristics of digital IC-logic families: RTL and DTL-TTL-ECL-MOS-CMOS-
Comparison of various logic families-Semiconductor memories-ROM and RAM
organization- Basic Memory cell - Memory decoding-Memory expansion-Static and
Dynamic RAM.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completion of the course the students will be able to
1. Explain number system and Boolean postulates and Realize Boolean functions
   with minimum number of logics.
2. Design and analyze combinational circuits and Implement combinational logic
   in PLDs.
3. Design and implement synchronous and asynchronous sequential circuits
4. Describe various logic families in digital IC.
5. Understand semiconductor memories and related technology.

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ECSP307 | BASIC ELECTRONICS LAB | L | T | P | C
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COURSE OBJECTIVES
- To verify the characteristics and applications of various semiconductor devices.

LIST OF EXPERIMENTS
1. Study of color codes and soldering practice
   Characteristics of junction diode, Zener diode
2. Zener diode as voltage regulators.
3. Half wave and full wave rectifiers without filter
4. Half wave and full wave rectifiers with filter
5. Simulate the wave shaping circuit using MultiSim
6. Transistor biasing circuits
7. Study of characteristics of transistor using MultiSim
8. Characteristics of FET
9. Characteristics of UJT
10. Characteristics of SCR
11. Characteristics of LDR and Photo Transistor.

**COURSE OUTCOMES**
At the end of course students will
1. Design and experiment with various application circuits using diodes
2. Understand the practical characteristics of BJT and JFET.
3. Apply principles and characteristics of semiconductor devices in designing simple application circuits.
4. Design and experiment with various signal circuits using BJTs and FETs.

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ECCP308 NETWORK ANALYSIS LAB

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<td>To verify basic laws on circuits and verify various network theorems.</td>
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<td>To understand Resonance concepts in AC circuits.</td>
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<td>To compute parameters for single and cascaded two-port Network.</td>
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**LIST OF EXPERIMENTS**
1. Verification of Ohm’s Law
2. Verification of Kirchoff’s Current Law
3. Verification of Kirchoff’s Voltage Law
4. Verification of Superposition Theorem
5. Verification of Thevinin’s and Norton’s Theorem
6. Verification of Maximum Power Transfer Theorem
7. Verification of Reciprocity Theorem
8. Study of AC circuits.
9. Study of Resonance Circuits
10. Computation of Network Parameters for Symmetric Network
11. Computation of Network Parameters for Asymmetric Network

**COURSE OUTCOMES**
At the end of course students will
1. Understand how to analyze circuits using Network theorems.
2. Acquire knowledge on resonance concepts in AC circuits.
4. Understand how to compute parameters for single and cascaded two-port Network.
### COURSE OBJECTIVES

1. To Design Combinational and sequential Digital circuits.

### LIST OF EXPERIMENTS

1. Study of Logic Gates.
2. Design of unit Adders and Subtractors,
5. Design of Multiplexer and Demultiplexer.
6. Design of encoders and Decoders.
7. Study of Flip Flops
8. Construction of Shift Register
10. Design of Non Sequential Counter
11. Frequency Divider using IC7490
12. Design of Sequence Generator and Detector
13. Study of Fault Diagnosis in Combinational Circuits.

### COURSE OUTCOMES

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

1. Design simple combinational logic circuits using gates
2. Verify the functionalities of various gates.
3. Understand the characteristics of flip-flops
4. Apply the design Procedures to design basic sequential circuits.
COURSE OBJECTIVES

- To introduce the concepts of probability & random signals.
- Know the theorems related to random signals.
- To give exposure to the students about the properties of random signal & random processes.
- To introduce the concepts of transmission of random process through LTI.

UNIT I
Sets and set operations
Probability space, Conditional probability and Bayes theorem, Combinatorial probability and sampling models.

UNIT II
Random Variables
Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions

UNIT III
Operations on Random Variables
Joint distributions, functions of one and two random variables, moments of random variables, Conditional distribution, densities and moments, Characteristic functions of a random variable: Markov, Chebyshev and Chernoff bounds

UNIT IV
Random Sequences and Convergence
Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.

UNIT V
Random Process and Power Spectral Density

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of this course students will demonstrate the ability to
1. Understand representation of random signals
2. Understand properties of random signal processes.
3. Investigate characteristics of random processes
4. Make use of theorems related to random signals
5. To understand propagation of random signals in LTI systems.

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ECES402   MATERIAL SCIENCE   L  T  P  C
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COURSE OBJECTIVES
- To impart fundamental understanding of how the various properties of materials drawn from different length scales of electronic and molecular structures that can be used in designing electronic devices.
- To gain vast knowledge of various conducting, superconducting, semiconducting, magnetic, dielectric, optical, smart and nano composite materials

UNIT I
Conducting Materials

UNIT II
Semiconducting Materials
Elemental and Compound Semiconductors and Their Properties - Carrier Concentration Intrinsic Semiconductors - Carrier Concentration in N-Type and P-Type Semiconductors - Variation of Fermi Level and Carrier Concentration with temperature - Hall Effect – Applications.
UNIT III
Magnetic and Dielectric Materials


UNIT IV
Optical Materials


UNIT V
New Engineering Materials


TEXT BOOKS

REFERENCES


COURSE OUTCOMES

At the end of the course, the students would
1. Acquire knowledge of a wide variety of materials
2. Analysis of suitability of materials for various applications in designing products useful for the society.
3. Gain knowledge of new engineering materials such as nano and optical materials
4. To gain vast knowledge of various magnetic, dielectric, optical, smart and nano composite materials.
5. To gain vast knowledge of various conducting, superconducting, semiconducting materials.

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ECPC403 ANALOG CIRCUITS

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COURSE OBJECTIVES

- To gain knowledge about the basic electronic circuits
- To acquire an in-depth knowledge of low frequency and high frequency analysis of BJT and FET amplifiers
- To design large signal amplifiers and tuned amplifiers
- To design feedback amplifiers and oscillators
- To design the wave shaping circuits

UNIT I
Diode Circuits, Amplifier models
Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance for BJT and FET amplifier for BJT and FET. small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

UNIT II
Frequency Models and Feedback Amplifiers
High frequency transistor models, frequency response of single stage and multistage amplifiers, cascade amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

UNIT III
Oscillators
Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators, crystal oscillator.
UNIT IV
Operational Amplifier


UNIT V
**Digital-to-analog converters (DAC)**: Weighted resistor, R-2R ladder, resistor string etc. **Analog-to-digital converters (ADC)**: Single slope, dual slope, successive approximation, flash etc.

**TEXT BOOKS**

**REFERENCES**

**COURSE OUTCOMES**
At the end of this course students will demonstrate the ability to
1. Understand the characteristics of diodes and transistors
2. Design and analyze various rectifier and amplifier circuits
3. Design sinusoidal and non-sinusoidal oscillators
4. Understand the functioning of OP-AMP and design OP-AMP based circuits
5. Design ADC and DAC

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COURSE OBJECTIVES

The student should be made to

- Study the Architecture of 8085 and 8086 microprocessor.
- Learn the detail aspects of I/O and Memory Interfacing circuits.
- Study the Architecture of 8051 microcontroller.
- Study about 8051 micro controller interfacing with various applications
- Do Assembly language programming in clear perspective

UNIT I
8085 Microprocessor


UNIT II
8086 Microprocessor

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT III
Peripheral Devices


UNIT IV
8051 Architecture


UNIT V
Microcontroller Interfacing


TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of the course, the student should be able to
1. Understand the architecture of 8085 and 8086 microprocessor.
2. Acquire knowledge on Peripheral Devices.
3. Understand the architecture of 8051 microcontroller based systems.
4. Able to write simple programs on Programming of 8085 and 8086 microprocessor and 8051 microcontrollers.
5. Understand the Interfacing of 8051 microcontroller for various applications.

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ECPC405 ANALOG COMMUNICATION

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COURSE OBJECTIVES
- To give a brief knowledge in random process and sources of noise in Communication Systems.
- To expose the concepts of basic communication in analog domain and Amplitude modulation/demodulation
- To familiarize the Angle modulation/ demodulation
- To know the working knowledge of the fundamental pulse modulation

UNIT I
Introduction to Random Process and Noise Theory
UNIT II
Amplitude Modulation


UNIT III
Angle Modulation


UNIT IV
Transmitters and Receivers

AM transmitter - low level transmitter, high level transmitter - AM Receivers - TRF receivers, Superheterodyne receivers - Noise in AM systems.
FM transmitter - Direct and Indirect Method of Frequency Modulation - FM Superheterodyne Receiver - Effect of Noise in Angle Modulated Systems - Threshold Effect in FM system - Threshold Improvement - Pre-emphasis and De-emphasis Circuits - Frequency Modulation with Feedback (FMFB).

UNIT V
Analog Pulse Modulation

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, the students will be able to
1. Discuss principles of different analog modulation Techniques
2. Analyze and Design AM and FM modulation and Demodulation circuits.
3. Analyze the noise performance of AM and FM systems
4. Describe various pulse modulation techniques.
5. Design a prototype model of Transmitter and Receiver Circuits.

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ECPC406 SIGNALS AND SYSTEMS

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COURSE OBJECTIVES
The objectives of this course are
- To develop good understanding about signals, systems and their classification
- To provide with necessary tools and techniques to analyze electrical networks and systems
- To develop expertise in time-domain and frequency domain approaches to the analysis of continuous and discrete systems;
- To introduce to the basics of probability, random variables and the various distribution and density functions; and
- To develop students’ ability to apply modern simulation software to system
UNIT I
Introduction to Signals and Systems

Signals and systems as seen in everyday life, and in various branches of engineering and science. Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

UNIT II
LSI Systems


UNIT III
Fourier Transform

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases.

UNIT IV
Laplace Transform and z-Transform

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

UNIT V
State-space Analysis and Sampling


TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of this course students will demonstrate the ability to
1. Represent & classify signals, Systems & identify LTI systems
2. Find Fourier transform for different signals
3. Analyze the Continuous Time systems by performing Convolution
4. Understand Discrete-time systems and LTI systems.
5. Analyze DT systems & their realization using Z-transforms

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COURSE OBJECTIVES
1. To design BJT and FET amplifiers and to study their frequency characteristics.
2. To design Oscillators using discrete components and using MultiSim software.

LIST OF EXPERIMENTS
1. Frequency response of BJT amplifier
2. Frequency response of FET amplifier
4. Design and analysis of feedback amplifier
5. Design of RC phase shift oscillator
6. Design of Class B power amplifier
7. Design of Single tuned amplifiers.
8. Design of Astable Multivibrator using transistors
9. Design of Schmitt trigger
10. Design and Simulation of Bistable multivibrator using MultiSim
11. Design and Simulation of Complementary Symmetry push pull amplifier using MultiSim
12. Design and Simulation of Hartley oscillator using MultiSim
13. Design and Simulation of Colpitt’s oscillator using MultiSim
COURSE OUTCOMES
At the end of course students will
1. Design Oscillators and amplifiers using discrete components.
2. Able to use MultiSim software for design and analysis of electronic circuits.
3. To Design BJT and FET amplifiers and to study their frequency characteristics.
4. To design Oscillators using discrete components and using MultiSim software.

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ECCP408 MICROPROCESSORS AND MICRO CONTROLLER LAB

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COURSE OBJECTIVES
- To study programming concepts of micro controllers using assembly language program.
- To study programming concepts of microprocessors and controllers using assembly language program.
- To study various peripheral IC interfacing and programming.
- To study various programming concepts of arithmetic and logical operations.

LIST OF EXPERIMENTS
1. Simple programs for sorting given set of numbers in ascending and descending order.
2. Arithmetic operations using 8085 Microprocessor.
3. Arithmetic operations using 8086 Microprocessor.
4. Study of Programmable Peripheral Interface 8255
5. Study of Programmable Timer 8253
6. Study of Serial Data Transfer Using 8251 USART.
7. Study of Programmable Interrupt Controller 8259.
8. Waveform generation using two channel 8-bit DAC0800.
9. Interfacing 0809ADC to 8085 Processor.
10. Interfacing of Stepper Motor to 8085 Processor.
11. Study of 8051 microcontroller and interfacing Seven Segment LED Display
12. Study of 8097 microcontroller and interfacing DAC and ADC in 8097 microcontroller
13. Study of Microcontroller PIC 16F877 and its applications
COURSE OUTCOMES
Upon completion of the course, the students will be able to
1. Understand the instruction sets of 8085 and 8086 microprocessors and controllers to write assembly code for Data handling and arithmetic and logic operations.
2. Interface and Program various peripheral ICs.
3. Able to program microprocessor and Micro controllers for Real time applications.
4. Interfacing a external devices with microprocessors.
5. Design a simple applications with microprocessors and microcontrollers.

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ECPC409 ANALOG COMMUNICATION LAB | L | T | P | C
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COURSE OBJECTIVES
- To investigate various analog modulation and demodulation circuits.
- To study and verify sampling theorem.
- To understand various pulse modulation techniques.
- To experimentally study characteristics of filter circuits.

LIST OF EXPERIMENTS
1. Amplitude Modulation and Demodulation.
2. DSB-SC Modulation and Demodulation.
3. SSB-SC Modulation and Demodulation.
4. Frequency Modulation and Demodulation.
5. Pre-emphasis and De-emphasis circuits.
6. Verification of Sampling Theorem.
7. Generation and Detection of PAM, PWM and PPM signals.
8. Time Division Multiplexing
10. Study of Receiver characteristics.
11. Study of Equalizer and attenuator.
COURSE OUTCOMES
Upon successful completion of this course, the students will be able to
1. Demonstrate various analog modulation and demodulation circuits.
2. Construct filter circuits for Receivers and able to analyze Receiver characteristics.
3. Demonstrate Various Pulse modulation and Demodulation circuits.
4. Design Internal circuits within transmitter and receiver.

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COURSE OBJECTIVES
The objectives of this course is
- To detail about different means of base band digital transmission.
- To familiarize the students about the types of digital band pass transmission.
- To provide basic knowledge about the use of various channel coding techniques.
- To illustrate the concepts of synchronization and Equalization techniques.
- To understand spread spectrum techniques.

UNIT I
Baseband Transmission and Reception

UNIT II
Bandpass Signalling

UNIT III
Channel Coding
Convolution Encoding – Maximum Likelihood Decoding – Viterbi Decoding – Sequential Decoding – Reed Solomon Encoding and Decoding.
UNIT IV
Equalization and Synchronisation
  Channel Characterization- Eye Pattern- Equalization Filter Types – Transversal, Decision Feedback, Preset and Adaptive Equalization – Filter Update Rate.
UNIT V
Spread Spectrum Techniques
  Spread Spectrum - PN Sequences, Direct Sequence and Frequency Hopping

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course students will be able to
1. Explain different means of base band and band pass digital transmission.
2. Apply various channel coding techniques for data transmission.
3. Illustrate the concepts of synchronization and Equalization techniques.
4. Understand spread spectrum techniques.
5. Design basic Encoder and decoder circuits.

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Mapping with Programme Outcomes(POs)
COURSE OBJECTIVES

- To study DFT and its computation
- To study the design structures of digital filters and Z-transform
- To study the design of Digital IIR filters
- To study the design of Digital FIR filters
- To study the fundamentals of digital signal processors.

UNIT I
Discrete Fourier Transform Discrete Signals and Systems


UNIT II
Design of Digital IIR Filters


UNIT III
Design of Digital FIR Filters Structure of FIR filters

Linear Phase FIR digital Filters – Minimizing design criteria (Fourier design technique) – Filter design using Windowing technique (Rectangular, Hamming, Hanning Window) – Kaisar Window.

UNIT IV
Digital Filter Structures Definition of digital filters


UNIT V
Digital Signal Processors Generic DSP Architecture

Architecture of TMS 320C5X and TEXAS 5416 processor – memory and I/O Organization – CPU –Program control – Addressing modes – Assembly Language Instructions – On chip peripherals – Clock, watch dog and real time Interrupt, event manager units – Interface units – Simple Programs.
TEXT BOOKS

REFERENCES

COURSE OUTCOMES
The students will be able to understand the
1. Computation procedures for DFT using FFT algorithms
2. Analysis and design of FIR and IIR filters.
3. Finite word length effects in filter design
4. Fundamentals of digital signal processors
5. DSP Processor Architecture and Programming

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ECPC503 | VLSI DESIGN | L | T | P | C |
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COURSE OBJECTIVES
The course intends to provide an understanding of VLSI Design process and to bring both
system and circuit view on design together.

- To study the Characteristics of MOS, CMOS transistors.
- To learn transistor level CMOS logic design.
- To understand NMOS and CMOS fabrication process, design rules.
- It offers a profound understanding of principle of operation of various Analog circuits.
- To impart knowledge about designing digital circuits like adders and multipliers.
UNIT I
VLSI Design Concepts
UNIT II
VLSI Fabrication Techniques
UNIT III
Analog VLSI
UNIT IV
Digital VLSI
Logic Design: Switch Logic and Gate Logic - Dynamic CMOS Logic - Structured Design Examples: Simple Combinational Logic and Clocked Sequential Design.
UNIT V
Programmable ASICs AND VHDL
TEXT BOOKS
REFERENCES

COURSE OUTCOMES
Upon completion of the course the students will be able to
1. Describe a VLSI Design flow for any complex digital system
2. Design CMOS circuit to realize specific logic functions and draw their symbolic layouts
3. Analyze various sub-circuits used in analog IC
4. Design and analyze digital circuits like multipliers, adders
5. Describe architecture and programming technologies of FPGA and CPLD.

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ECPC504 ELECTROMAGNETIC WAVES

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COURSE OBJECTIVES
- To introduce the different types of Coordinate systems.
- To encapsulate the students with electric and Magnetic field terminologies.
- To make the students comprehend the various applications of Gauss law.
- To elucidate the different method of determining magnetic field occurring in a solenoid, toroid etc.
- To familiarize the various propagation techniques of waves and their polarization phenomenon.
UNIT I
Electrostatics
Introduction to co-ordinate system: Cartesian, Cylindrical and Spherical, Review of vector calculus, Coulomb’s Law in Vector Form - Electric Field due to discrete charges - Electric field due to continuous charge distribution - Electric Scalar Potential-Relationship between potential and electric field -Gauss Law-gauss Divergence theorem- Laplace’s and Poisson’s equation

UNIT II
Magnetostatics and Time Varying Fields

UNIT III
Electromagnetic Waves

UNIT IV
Transmission Lines
Transmission Lines- Equations of Voltage and Current on Transmission line – Propagation constant and characteristic impedance, and reflection coefficient and VSWR – Impedance Transformation on Loss-less and Low loss Transmission line – Power transfer on TX line – Smith Chart, Admittance Smith Chart – Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

UNIT V
Waveguides
Solutions of Wave Equations in Rectangular Coordinates – TE and TM Modes in Rectangular Waveguides – Impossibility of TEM Mode in Rectangular Waveguides-Excitation of Modes InRectangular Waveguides. Circular Waveguides: Solutions of Wave Equations in Circular Waveguides – TE, TM and TEM Modes in Circular Waveguides- Excitation of Modes in Circular Waveguides

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of this course students will demonstrate the ability to
1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carry out impedance transformation on TL.
3. Use sections of transmission line sections for realizing circuit elements.
4. Calculate reflection and transmission of waves at media interface.
5. Understand principle of radiation and radiation characteristics of an antenna.

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ECCP507 DIGITAL COMMUNICATION LAB

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COURSE OBJECTIVES
The objectives of this course is
- To experimentally study various baseband and band pass digital modulations.
- To understand data coding and error control coding techniques.
- To use MATLAB software in simulation and performance analysis of digital modulation techniques

LIST OF EXPERIMENTS
1. Pulse Code modulation and demodulation.
2. Delta modulation and demodulation.
3. Adaptive Delta modulation.
5. Sigma delta modulation and demodulation.
6. Time division multiplexing and Demultiplexing.
7. Data coding and decoding techniques for Return to Zero format and Multilevel Binary Format.
8. Data coding and decoding techniques for Phase Encoded Format.
9. ASK, FSK, PSK modulation and demodulation.
10. QPSK modulation and demodulation.
11. Synchronization techniques in PCM.
12. DPSK modulation and demodulation using MATLAB.
13. QAM modulation and demodulation using MATLAB.
15. Error control coding techniques using MATLAB.

**COURSE OUTCOMES**

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

1. Demonstrate various digital base band and pass band modulation techniques.
2. Verify data coding and error control coding techniques.
3. Understand various synchronization techniques used in digital communication.
4. Use MATLAB software for the analysis and implementation of digital modulation techniques.

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**ECCP508 DIGITAL SIGNAL PROCESSING LAB**

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**COURSE OBJECTIVES**

- To realize arithmetic, logical, data transfer and convolution operations on DSP processors using assembly code.
- To Design digital filters using DSP processors.
- To Develop simple algorithms for signal processing and test them using MATLAB.
- To analyze and design LTI-Digital systems using MATLAB.

**LIST OF EXPERIMENTS**

1. Perform the given Arithmetic Operations and Data Transfer using TMS320C50
2. Obtain the Linear and Circular Convolution using TMS320C50
3. Design of II R and FIR filter using TMS320C50
4. Waveform Generation Using TMS320C50
5. Perform the arithmetic and logical operations using TMS320C5416 and TMS320F6713.
6. Generation and Simple Operations of Signals Using MATLAB
7. Determine the Impulse Response and Step Response of a Causal LTI System
8. Frequency Response of First Order and Second Order System using MATLAB
9. Obtain the Convolution and Correlation of the given sequence using MATLAB
10. Design of IIR Filters using MATLAB
11. Design of FIR using Windowing Techniques using MATLAB
12. Simple Operations on Images using MATLAB

COURSE OUTCOMES
Upon completion of this course, the students will be able to
1. Experiment concepts of Digital Signal processing and its applications using MATLAB.
2. Understand programming concepts of TMS320C50, TMS320C5416 and TMS320F6713 processors.
3. Develop digital filters using MATLAB and DSP processors.
4. Familiarize with the convolutional and correlation operations.

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COURSE OBJECTIVES
The objectives of this course is
- To gain expertise in design, development and simulation of digital circuits with VHDL.
- To implement digital circuits on FPGA/CPLD devices.
- To analyse and implement basic circuits using Tanner tool.

LIST OF EXPERIMENTS
1. Study of Xilinx simulation and synthesis tool.
2. Design of unit adders and subtractors
3. Design and testing of parallel adder-subtractor.
4. Design and testing of BCD adder.
5. Design and testing of multiplexer and demultiplexer.
6. Design and testing of four bit magnitude comparator.
7. Design and testing of array multipliers.
8. Design and testing of flip-flops.
9. Design and testing of synchronous counters.
10. Design and testing of asynchronous counters.
11. Design and testing of scrambler and descrambler.
Experiments using TANNER tool
12. Functional verification of CMOS inverter.
13. Functional verification of CMOS universal logic gates.
15. Layout of CMOS inverter.

Tools: Xilinx software, Tanner tool

COURSE OUTCOMES
Upon completion of the course the student will be able to
1. Develop a architecture of digital circuit for various applications
2. Develop VHDL model for digital circuits.
3. Implement digital circuits on FPGA/CPLD devices.
4. Develop layout of CMOS logic gates.

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ECPC601 EMBEDDED SYSTEMS

Course Objective

1. To provide a clear understanding on the basic concepts, Building Blocks of Embedded System.
2. To teach the fundamentals of Embedded processor Modeling, Bus Communication in processors, Input/output interfacing
3. To introduce on processor scheduling algorithms, Basics of Real time operating system

UNIT I
Introduction to Embedded Systems
Introduction to Embedded Systems – Structural units in Embedded processor, selection of processor & memory devices- DMA, Memory management methods-memory mapping, cache replacement concept, Timer and Counting devices, Watchdog Timer, Real Time Clock.

UNIT II
Embedded Networking and Interrupts Service Mechanism
UNIT III
High Performance RISC Architecture – ARM

UNIT IV
Software Development Tools

UNIT V
RTOS Based Embedded System Design
  Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication- shared memory, message passing, Comparison of commercial RTOS features - RTOS Lite, Full RTOS, VxWorks, RT Linux.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
1. Describe the differences between the general computing system and the embedded system.
2. Foster ability to understand the role of embedded systems in industry.
3. Understand and develop programming using ARM processor.
4. Understand the concepts of Software Development Tool and Programming
5. Design real time embedded systems using the concepts of RTOS.
### Mapping with Programme Outcomes (POs)

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### COURSE OBJECTIVES

- To understand the concept of data communication and data coding techniques.
- To comprehend the use of different types of digital data interfaces and modems.
- To understand the concept of network architecture and protocols.
- To understand the division of network functionalities into layers.
- To be familiar with the components required to build different types of networks.
- To be exposed to the required functionality at each layer.
- To learn the flow control and congestion control algorithms.

### UNIT I

**Basic Concepts**


### UNIT II

**Digital Data Interfaces and Modems**


### UNIT III

**Data Link Layer**

UNIT IV
Network and Transport Layers

UNIT V
Session, Presentation and Application Layers

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
1. Have a good understanding of the data communication system and modes of transmission.
2. Have a basic knowledge of the use of digital data interfaces.
3. Have a working knowledge of network architecture and protocols.
4. Identify the components required to build different types of networks.
5. Choose the required functionality at each layer for given application.

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### COURSE OBJECTIVES

- Learn the working of ARM processor
- Understand the Building Blocks of Embedded Systems
- Learn the concept of memory map and memory interface
- Know the characteristics of Real Time Systems
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance

### LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Flashing of LEDs.
8. Interfacing stepper motor and temperature sensor.
9. Implementing zigbee protocol with ARM.

### COURSE OUTCOMES

On completion of the course, students will be able to

1. Write programs in ARM for a specific Application
2. Interface memory and Write programs related to memory operations
3. Interface A/D and D/A convertors with ARM system
4. Write programs for interfacing keyboard, display, motor and sensor.
5. Formulate a mini project using embedded system.

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Mapping with Programme Outcomes (POs)
COURSE OBJECTIVES

The objectives of this course is

- To explain about basic network components and devices in a network
- To find out performance of different wired LAN protocols
- To analyze wireless LAN protocol
- To use different algorithms for finding out shortest path between any nodes

LIST OF EXPERIMENTS

1. Demonstration of network devices and crimping of Ethernet cable.
2. Performance Study of ALOHA protocol for packet communication between nodes in a network.
3. Performance Study of CSMA protocol for data communication between nodes in a network.
5. Performance Study of Token Bus access method in a bus network.
6. Performance Study of Token Ring access method in a ring network.
8. WLAN realization and throughput measurement.

COURSE OUTCOMES

On completion of the course, students will be able to

1. Understand fundamental underlying principles of computer networking devices.
2. Implement basic wired LAN protocol such as ALOHA in a network and find its performance.
3. Implement IEEE standard protocols for wired LAN such as IEEE 802.3, 802.4 and 802.5 and find its performance.
4. Implement wireless LAN protocol in a network and find its performance.
5. Understand the algorithm for finding shortest path between any two nodes in a network.

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Mapping with Programme Outcomes (POs)
COURSE OBJECTIVES

The objectives of this course is
- To understand the moral and ethical dimensions in engineering
- To take balanced decisions.
- To understand the ethical problems and principles through theory, historical case studies and research and presentation.
- To allow students to explore the relationship between ethics and engineering
- To apply classical moral theory and decision making to engineering issues encountered in academic and professional careers

UNIT I
Moral Reasoning and Ethical Theories

UNIT II
Engineering as Social Experimentation

UNIT III
Engineer Responsibility for Safety

UNIT IV
Responsibility and Rights

UNIT V
Global Issues

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of the course, the student will be able to
1. Understand the relationship between the Engineer and the Society.
2. Learn the importance of codes in engineering practice.
3. Acquire knowledge on the legal, moral and ethical aspects in Engineering.
4. Understand the moral and ethical dimensions in engineering.
5. Knowledge about Multinational Corporation.

COURSE OBJECTIVES
The objectives of this course is
- To impart the essential knowledge to the students to learn about the Microwave generators working with different kinds of Microwave Components.
- To enhance the students proficiency about microwave solid state devices and deriving scattering matrix.
- To provide sufficient Information about Noise analysis in Microwave Engineering.
- To accomplish a thorough idea about direct and indirect Microwave parameter measurements.

Mapping with Programme Outcomes (POs)

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ECPC702  MICROWAVE ENGINEERING  L T P C
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UNIT I
Microwave Network Analysis

UNIT II
Microwave Linear Beam Tubes

UNIT III
Microwave Crossed-Field Tube and Solid State Devices

UNIT IV
Microwave Devices

UNIT V
Microwave Measurements

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, the student will able to
1. Understand the working principles of Microwave Solid and Non solid state devices.
2. Analysis of the characteristics and behavior of Microwave Networks and components.
3. Analyze about Measurement concepts in Microwave Engineering.
4. To provide sufficient Information about Noise analysis in Microwave Engineering.
5. To accomplish a thorough idea about direct and indirect Microwave parameter measurements.

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COURSE OBJECTIVES
• To Study the characteristics of microwave sources and microwave components.
• To Study the radiation characteristics of Horn and parabolic antennas.
• To study microwave measurements.

LIST OF EXPERIMENTS
1. Study of Microwave Components
2. VI Characteristics and Frequency Response of Gunn Oscillator
3. Mode Characteristics of Reflex Klystron Oscillator
4. Measurement of Attenuation, VSWR, Wave Length and Operating Frequency using Microwave Test bench
5. Characteristics of E, H and Magic Tee Plane using Microwave Test bench
6. Characteristics of Circulator using Reflex Klystron Oscillator
8. Measurement of Radiation Characteristics of Parabolic antenna
9. Characteristics of Directional Coupler 3dB and 20dB using Microwave Test bench
10. Measurement of Unknown Impedance of Pyramidal Antenna using Gunn oscillator
11. Measurement of Dielectric Constant for the given solid using Microwave Test bench.

**COURSE OUTCOMES**
At the end of the course students will be able to
1. Demonstrate characteristics of Microwave sources and components.
2. Analyze radiation pattern for Microwave antennas.
3. Measure Unknown impedance, Microwave power, attenuation and VSWR using appropriate bench setup.
4. Analyze the radiation characteristics of Horn and parabolic antennas.

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**Mapping with Programme Outcomes (POs)**
COURSE OBJECTIVES

- To attempt the solution to the problem by analytical/simulation/experimental methods and validate with proper justification.
- To carry out thesis work which is an integral part of the thesis consisting of problem statement, literature review, thesis overview and scheme of implementation.

METHOD OF EVALUATION

- The student undergoes literature survey and identifies the topic of thesis and finalizes in consultation with Guide/Supervisor and prepare a comprehensive thesis report after completing the work to the satisfaction of the supervisor.
- The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.
- A thesis report is required at the end of the semester.
- The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES

1. Review quality of Literature survey and Novelty in the problem
2. Assess clarity of Problem definition and Feasibility of problem solution
3. Validate the relevance to the specialization
4. Acquire Knowledge on the clarity of objective and scope
5. Improve the quality of Written and Oral Presentation
### Mapping with Programme Outcomes (POs)

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### COURSE OBJECTIVES

- To introduce to the students, the concept of information and entropy of Information.
- To understand the mathematical foundation of compression.
- To acquire Knowledge in error control and security of information.

### UNIT I

**Information Theory Basics**

Information - Measure of information - Information rate - Entropy - Entropy of symbols - Continuous and discrete messages - Joint and conditional Entropies - Basic relationship among different entropy.

### UNIT II

**Mutual Information and Coding Theorem**

Entropy for Discrete Ensembles - Properties of Entropy of a Binary memory less source - Extension of a binary memory less source - Source Coding Theorem - Shannon Fanon coding - Huffman Coding - Uniquely detectable codes.

### UNIT III

**Shannon's and Channel Coding Theorem**


### UNIT IV

**Linear and Cyclic Codes**

Linear block Codes - Generator matrices - Parity check matrices - Encoder - Syndrome and error correction - Minimum distance - Error correction and Error detection capabilities - Cyclic codes.

### UNIT V

**Other Coding Techniques**

Convolution codes - Encoder - Generator matrix - Generator Polynomial - State diagram - Distance properties - Maximum likelihood decoding - Viterbi decoding - Sequential decoding - Hadamard matrices and Hadamard codes - BCH codes - Description, decoding - Reed Solomon code.
TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, the student will demonstrate the ability to:
1. Understand the Concept of Information and Entropy.
2. Understand Shannon’s Theorem for Coding.
3. Calculation of Channel Capacity.
4. Apply Coding Techniques.
5. Illustrate Various Coding Techniques.

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COURSE OBJECTIVE
• To give insight to fundamentals of antenna
• To provide complete understanding about the characteristics of different antenna
• types and antenna arrays
• To enrich knowledge about the present day technologies in the field of antenna
• To introduce printed antenna and its design
• To provide information advancement in antennas particularly smart antennas
UNIT I
Antenna Fundamentals

Fundamental Concepts- Physical concept of radiation-Radiation pattern-near- and far-field regions-reciprocity-directivity and gain-effective aperture-polarization-input impedance-efficiency-Friis transmission equation-radiation integrals and auxiliary potential functions

UNIT II
Wire Antenna and Aperture Antennas


UNIT III
Antenna Arrays


UNIT IV
Special Purpose Antennas


UNIT V
Microstrip Antenna

Micro strip Antennas- Basic characteristics of micro strip antennas-feeding methods-methods of analysis-design of rectangular and circular patch antennas

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
Completing the course students will be able to
1. Explain the various antenna parameters
2. Describe about different types of antenna and their radiation characteristics
3. Analyze and design Microstrip antenna and antenna arrays
4. Design antenna arrays using various synthesis technique
5. Provide an alternative to traditional antenna design through smart antennas.

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ECPESCN | CONTROL SYSTEMS | L | T | P | C |
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COURSE OBJECTIVES
- Modeling of translational and rotational system, block diagram reduction techniques and
- Signal flow graph for obtaining transfer function.
- Transient analysis of various standard inputs for first order and second order system.
- Frequency response analysis and frequency domain specification by bode plot and polar plot.
- Stability analysis by Routh-Hurwitz criterion and Nyquist stability criterion.
- State space analysis (writing state equation for physical, phase, canonical variables.)
- Concept of controllability and observability.

UNIT I
System Modelling

UNIT II
Time Domain Analysis
UNIT III
Frequency Domain Analysis

UNIT IV
Digital Control Systems

UNIT V
State Space Analysis

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
After completion of the subject, students able to get a knowledge in various aspects of
1. Mathematical models for such electrical and mechanical systems
2. Equivalent state space model for given system
3. Time and Frequency domain analysis with response to test inputs
4. Analysis of sampled data control system using Z-transform.
5. Stability analysis by Routh -Hurwitz criterion and Nyquist stability criterion.

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61
COUSE OBJECTIVES

The student should be made to

- Learn the working of human body starting from Cells.
- Exposed to electrical and non-electrical physiological measurements and bio amplifiers
- Know the principle, design and application of various human assist devices and aids

UNIT I
Introduction to Human Physiology

Brief introduction to human physiology – Structure of cell, function of each components of the cell – Anatomy of human heart, Cardiac cycle, ECG – Anatomy and physiological aspects of respiration – Anatomy and physiological aspects of GI System, Digestion and absorption – Anatomy of human kidney.

UNIT II
Biomedical transducers

Biomedical transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.

UNIT III
Bio-Potential Amplifiers


UNIT IV
Measurement of non-electrical parameters

Measurement of blood temperature, pressure and flow Impedanceplethysmography Ultrasonic, Xray and nuclear imaging.

UNIT V
Prosthetic Equipment


TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Understand the functioning of human body
2. Understand the application of the electronic systems in biological and medical applications.
3. Understand the practical limitations on the electronic components while handling biosubstances.
4. Understand and analyze the biological processes like other electronic processes.
5. Understand the role and importance of assist devices and the importance of rehabilitation and related aspects.

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COURSE OBJECTIVES
- To introduce the basic functional elements of instrumentation and the fundamentals of electronic instruments
- To introduce To educate on the comparison between various measurement techniques
- To introduce various recorders, transducers and the data acquisition systems
- To understand the fundamentals of Electronics Instruments and Measurement providing an in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers.

UNIT I
Block Schematics of Measuring Systems
Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D’ Arsonval Movement, DC Current Meters, AC
Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT II
Transducers
Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchronous, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Stricitive Transducers.

UNIT III
Bridges

UNIT IV
Oscilloscopes
CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications - Special Purpose Oscilloscopes - Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

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

TEXT BOOKS

REFERENCES
COURSE OUTCOMES

Upon a successful completion of this course, the student will be able to:

1. Describe the fundamental concepts and principles of instrumentation and apply the measurement techniques for different types of tests.

2. Able to select specific instrument for specific measurement function and Understand principle of operation, working of different electronic instruments like digital multi meter, vector voltmeter.

3. Learners will apply knowledge of different oscilloscopes like CRO, DSO. Students will understand functioning, specification, and applications of signal analyzing instrument

4. Acquire knowledge of display instruments, amplifier measurements and CRO Distinguish recorders, transducers, data acquisition systems and display devices. frequency and period measurements.

5. Select the instrument to be used based on the requirements and Understand and analyze different signal generators and analyzers and the design of oscilloscopes for different applications.

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COURSE OBJECTIVES

- Be familiar with the operating principles of fiber optics and its characteristics.
- Describe modulation, multiplexing and de multiplexing in fiber optic systems.
- Perform noise and error analysis on fiber optic communication systems

UNIT I

Overview of Optical fiber Communications

UNIT II

Optical fibers : Structures, Wave guiding and Fabrication

Different types of optical fibers, Comparison of Optical fiber Communication Systems With other Communication System, Optical laws and definitions, optical fiber modes and configurations, Mode theory, Step Index and Graded Index (GI) fibers, single mode and graded index fibers, Derivation for numerical aperture, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

UNIT III

Optical Sources and Detectors

Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, fiber-to-fiber joints, LED coupling to single mode fibers, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

UNIT IV

Advances and Overview of Optical Components

Nonlinear effects in fiber optic links. Optical couplers, Tunable sources and Filters, optical MUX/DEMUX Concept of self-phase modulation, group velocity dispersion and solution based communication.

UNIT V

Optical Amplifiers


TEXT BOOKS


REFERENCES

COURSE OUTCOMES
1. Understand the principles fiber-optic communication, the components and the bandwidth advantages.
2. Understand the properties of the optical fibers and optical components.
3. Understand operation of lasers, LEDs, and detectors
4. Analyze system performance of optical communication systems
5. Design optical networks and understand non-linear effects in optical fibers.

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**COURSE OBJECTIVE**
- To comprehend the image processing fundamentals and enhancement techniques in spatial and frequency domain.
- To understand the various image processing techniques.
- To study the various image segmentation and morphology operations.
- To comprehend the basics of video processing and video coding.

UNIT I
**Fundamentals of Image processing and Image Transforms**
Basic steps of Image processing system sampling and quantization of an Image
- Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms

UNIT II
**Image Processing Techniques**
Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters
Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering
Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation

UNIT III
**Wavelets and Multi-resolution image processing**
Uncertainty principles of Fourier Transform, Time frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets.
UNIT IV
Basic Steps of Video Processing
Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals, filtering operations

UNIT V
2-D Motion Estimation
Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

TEXT BOOKS

REFERENCES
2. Yao wang, Joem Ostarmann and Ya – quin Zhang, ”Video processing and communication”,1st edition , PHI.

COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Mathematically represent the various types of images and analyze them.
2. Process these images for the enhancement of certain properties or for optimized use of the resources.
3. Develop algorithms for image compression and coding.
4. Analyze the various image segmentation and morphology operations.
5. Work behind the basics of video processing and video coding.

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Mapping with Programme Outcomes(POs)
COURSE OBJECTIVES

- To understand discrete-time signal processing, analog integrated continuous-time and discrete-time (switched-capacitor) filters
- To have the knowledge of ADCs, DACs, Mixed-Signal layout and Interconnects
- To provide students knowledge and experience for mixed-signal IC design
- To develop the necessary framework and tools to analyze and design such systems

UNIT I
Basics
Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous-time filters: passive and active filters; Basics of analog discrete-time filters and Z-transform.

UNIT II
Switched-capacitor filters
Switched-capacitor filters- Non idealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications.

UNIT III
Data Converters
Basics of data converters; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs.

UNIT IV
Signalling Mixed-signal layout, Interconnects and data transmission; Voltage-mode signaling and data transmission; Current-mode signaling and data transmission.

UNIT V
Frequency Synthesizers and PLL
Introduction to frequency synthesizers and synchronization; Basics of PLL, Analog PLLs; Digital PLLs; DLLs.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Understand analog and discrete-time signal processing
2. Design analog integrated continuous-time and discrete-time (switched-capacitor) filters
3. Understand the practical situations where mixed signal analysis is required
4. Analyze and handle the inter-conversions between signals
5. Design systems involving mixed signals.

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COURSE OBJECTIVES
- To provide the basis for new computing paradigms that challenges many of the classical approaches to developing distributed and networking systems
- To learn the different types of MAC protocols
- To understand the architecture and protocols of wireless sensor networks
- To learn the architecture and its design constraints

UNIT I
Basics

UNIT II
MANETs
UNIT III
WSN Protocols
Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee, Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT IV
WSN Design
Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

UNIT V
WSN Operating Systems
Single-Node architecture, Hardware components and design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course the students will be able to
1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Be familiar with different types of routing protocols
5. Explore new protocols for WSN

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Mapping with Programme Outcomes (POs)
COURSE OBJECTIVES

- To introduce transmission line basics and various parameters that affects the performance of High speed circuits.
- To give exposure on analysis and design of RF circuits and components.
- To introduce various techniques for fabricating printed circuit board and assembling printed circuit board.

UNIT I
Basics
Transmission line theory (basics) crosstalk and non-ideal effects; signal integrity: impact of packages, vias, traces, connectors; non-ideal return current paths, high frequency power delivery, methodologies for design of high speed buses; radiated emissions and minimizing system noise.

Noise Analysis: Sources, Noise Figure, Gain compression – Harmonic distortion – Intermodulation – Cross-modulation – Dynamic range.

UNIT II
Passive and Active components
Passive components: RF behaviour of Resistor, Inductor and Capacitor; Active RF components: RF diodes, BJT, MOSFET, High electron mobility transistor – Modelling Diodes and Transistors at Radio frequencies.

UNIT III
RF Amplifiers

UNIT IV
RF Mixers and Oscillators
Mixers – Up conversion, down conversion – Conversion gain and spurious response. Oscillators, PLL, Transceiver architectures.

UNIT V
Printed Circuit Board

TEXT BOOKS
REFERENCES

COURSE OUTCOME
After completing this course, the student will be able to:
1. Understand various factors to be considered while designing high speed circuits.
2. Understand the behaviour of Passive and active components at Radiofrequencies.
3. Design RF amplifiers for various applications.
4. Demonstrate the working of RF Oscillators and Mixers.
5. Demonstrate various techniques for fabricating and assembling PCB.

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COURSE OBJECTIVES
- To learn and understand basic concepts of Nano electronics.
- To know the techniques of fabrication and measurement.
- To gain knowledge about Nanostructure devices and logic devices.

UNIT I
Introduction to Nano Electronics
UNIT II
Fabrication and Measurement Techniques
Shrink-down approaches, Growth, fabrication, and measurement techniques for nanostructures—Nanolithography, etching, and other means for fabrication of nanostructures and Nano devices—Techniques for characterization of nanostructures—Spontaneous formation and ordering of nanostructures—Clusters and Nano crystals—Methods of nanotube growth—Chemical and biological methods for Nano scale fabrication—Fabrication of Nano-electromechanical systems

UNIT III
Properties

UNIT IV
Nano Structure Devices

UNIT V
Applications
Introduction to Carbon nanotube electronics, Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation—Electronic devices for Logic Applications—Superconductor Digital Electronics—Molecular Electronics.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Able to set up and solve the Schrödinger equation for different types of potentials in one dimension as well as in 2 or 3 dimensions for specific cases.
2. Understand various aspects of nano-technology and the processes involved in making nano components and material.

3. Understand the Nano electronic systems and building blocks such as: low-dimensional semiconductors, heterostructures, carbon nanotubes, quantum dots, nanowires etc.

4. To use matrix methods for solving transport problems such as tunneling, resonant tunneling and know the concept of quantized conductance.

5. The student should be experimentally familiarized with the present research front in Nano electronics and to be able to critically assess future trends.

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**COURSE OBJECTIVES**

- Understand the significance of computing methods, their strengths and application areas.
- Perform the computations on various data using appropriate computation tools.

**UNIT I**

**Introduction**

Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy

**Computer Arithmetic**

Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmetic, Cancellation

**UNIT II**

**System of linear equations**

Linear least squares
Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting

UNIT III
Eigenvalues and singular values
Eigenvalues and Eigenvectors, Methods for Computing All Eigenvalues, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD

UNIT IV
Nonlinear equations
Fixed Point Iteration, Newton’s Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares

Interpolation
Purpose for Interpolation, Choice of Interpolating Function, Polynomial Interpolation, Piecewise Polynomial Interpolation

UNIT V
Numerical Integration And Differentiation

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Understand the significance of computing methods.
2. Analyze the strengths of the computing methods.
3. Discuss the platform and design the application areas.
4. Perform the computations on various data using appropriate computation tools.
5. Perform the computation on modern usage of tools.
COURSE OBJECTIVES

- To conceptualize the organization and architecture of Digital computer.
- To introduce the design procedures for data path and control path in computer system.
- To introduce the hierarchical memory system including cache memories and virtual memory in computers.
- To impart knowledge of I/O devices and standard I/O interfaces.
- To introduce the basics of pipelining and parallel processing techniques.

UNIT I
Basic Structure of Computers
Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language – Basic I/O operations – Stacks and queues.

UNIT II
Arithmetic Unit

UNIT III
Processing Unit and Pipelining concept
Fundamental concepts - Hardwired control - Micro programmed control- Nano Programming - Pipelining - Basic concepts - Data hazards - Instruction hazards - Superscalar operation.
UNIT IV
Memory Unit

UNIT V
System Organisation
Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB) – Parallel processing architectures and challenges.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
1. Demonstrate the understanding of functional units of computer, bus structure and addressing mode.
2. Apply algorithms to design arithmetic unit of a processor.
3. Demonstrate the working of single cycle and pipelined CPU.
4. Acquired knowledge on various memory types and memory management techniques.
5. Understand the concept of I/O organization and parallel processing techniques.

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**COURSE OBJECTIVES**
- To give an exposure to the various fixed point and floating point DSP architectures
- To understand the techniques to interface sensors and I/O circuits
- To implement applications using these processors.

**UNIT I**
**Fundamentals of Programmable DSP’s**

**UNIT II**
**TMS320C54X Processor**
Introduction - Architecture of 54X, 54X Buses, Internal Memory Organisation, Central Processing Unit - Data Addressing, Instruction Set, Pipeline Operation, Code Compressor Studio - Application Programs.

**UNIT III**
**DSP56XXX Processor**
Freescale DSP56XXX Architecture and Programming - Introduction, Core Architecture Overview, Data Arithmetic Logic Unit, Address Generation Unit, Program Control Unit, PLL and Clock Generator, Debugging Support, Instruction Cache, External Memory Interface, DMA Controller, Operating Modes and Memory Spaces, Instruction Set, Benchmark Programs.

**UNIT IV**
**Filtering Using DSP56XXX**

**UNIT V**
**TMS320C6X Processor**

**TEXT BOOKS**
REFERENCES
3. Digital Signal Processing Applications using the ADSP – 2100 Family, Volume 1
4. Mohammed El-Sharkawy, Digital Signal Processing Applications With Motorola’s

COURSE OUTCOMES
At the end of the course student will be able to
1. Learn the architecture details of fixed point DSPs.
2. Learn the architecture details of floating point DSPs.
3. Infer about the control instructions, interrupts, pipeline operations, memory and busses.
4. Illustrate the features of on-chip peripheral devices and its interfacing with real time application devices.
5. Learn to implement the signal processing algorithms and applications in DSPs.

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ECPESCN MOBILE ADHOC NETWORKS

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COURSE OBJECTIVES
- Students will get an introduction to Ad Hoc wireless network
- To study the introduction of protocols
- To understand the architecture of MANET
- Enable the students to know techniques involved to support mobility
- To motivate the students to do research on Issues of Ad hoc Networking
UNIT I
Introduction
Introduction to Ad Hoc Networks – Definition, Characteristics, Features, Applications of Ad Hoc Networks-Challenges and Advantages- Characteristics of Wireless Channel-Ad Hoc Mobility Models- Entity and Group-IEEE Standards: 802.11a, 802.11b, 802.11g, 802.15.

UNIT II
Routing Basics

UNIT III
Ad Hoc Network Protocols

UNIT IV
End-To-End Delivery and Security

UNIT V
Cross Layer Design and Quality of Service

TEXT BOOK

REFERENCES

COURSE OUTCOMES
The student will be able to
1. Describe the fundamental Characteristics, Features and Applications of MANETs.
2. Analyze the performance of various routing protocols and its Goals and Classification
3. Ability to understand the routing mechanism of Proactive and Reactive Routing
4. Students will understand the concept of cross layer design
5. Select the suitable routing protocol to be used based on the requirements

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ECPESCN INTRODUCTION TO MEMS
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COURSE OBJECTIVES
- To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
- To enable the student to understand the basic principles of sensors and actuators, materials and fabrication aspects of MEMS and Microsystems.
- To make the student familiar with the mechanical and the electrostatic design and the associated system issues.
- To introduce the student to the different MEMS applications, the design basics, the design tools and the performance issues.
UNIT I
Fundamentals
MEMS and Microsystems, Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Micro accelerometers and Micro fluidics, MEMS materials, Micro fabrication.

UNIT II
Review of Basic MEMS fabrication modules
Silicon as material, deposition techniques, lithography, doping, etching, silicon micromachining, wafer bonding, LIGA process, special materials like polymers and ceramics for microsystems

UNIT III
Micromachining
Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.

UNIT IV
Mechanics of solids in MEMS/NEMS
Stresses, Strain, Hookes’s law, Poisson effect, Linear Thermal Expansion, Bending; Energy methods, Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems.

UNIT V
MEMS Application Case studies
Capacitive accelerometer, Pezo electric pressure sensor, Microfluidics application, Modeling of MEMS systems, CAD for MEMS.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completing the course, the student should have
1. Appreciate the underlying introduction to MEMS.
2. Ability to comprehend and appreciate the significance and role of this course in the present basic MEMS fabrication modules.
3. The student would be able to demonstrate an understanding of the different aspects of Micromachining.
4. Given the user requirements and the functionality the student would be in a position to apply his knowledge for identifying a suitable mechanics of solids in MEMS/NEMS.

5. The student would be capable of applying his knowledge and design MEMS application tools.

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**COURSE OBJECTIVE**

- To make students familiar with fundamentals of mobile communication systems.
- To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
- To identify the requirements of mobile communication as compared to static communication.
- To identify the limitations of 2G and 2.5G wireless mobile communication and use design of 3G and beyond mobile communication systems.
- As a prerequisite for the course in Wireless LANs.

**UNIT I**

**Introduction**

Basic cellular system-Uniqueness of mobile radio environment- operation of cellular system-Cell site antennae and mobile antennae-Multipart fading-Delay spread-Coherence bandwidth-Models for predicting path loss-Cell coverage for signals and traffic-Real time co-channel interference-Non co-channel interference

**UNIT II**

**Cellular System**

Global system for mobile communication-Advanced mobile phone service-Digital cellular system-Cordless telephoning- Practical cellular mobile system. GSM Network and signaling-GSM short message services- International roaming-Administration and maintenance of GSM operation-Mobile number Portability-VOIP service for mobile networks.
UNIT III
Mobility Management
Frequency allocation-Cell splitting-Operational techniques and technologies-Mobile telephone switching office-Hand off-Hand off detection-Roaming management-Channel assignment techniques-Radio line transfer-Network signaling-Inter system hand off and authentication-PACS network signaling

UNIT IV
Wireless Application Protocol
WAP model-WAP gate way-WAP protocol-WAP UAPROF and Caching-Wireless barrier for WAP-WAP developer tool kits-Mobile station applications-Execution environment.

UNIT V
Mobile Communication Systems (Block diagram treatment)
Data links-Microwave antennas-Digital mobile telephony-Spread spectrum system to combat multipath-Radio paging-Trunk radio systems-Cordless Communication-Personal communication networks-Communication satellite systems-Third generation mobile services-Wireless enterprise networks.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, Student will be able to
1. Describe the evolution and History of Wireless Technology.
3. Determine the downlink and uplink frequencies for AMPS channel 326 on A Side channels.
4. List the use of at least two advantages of Digital encoding for cellular telephone systems.
5. Explain the function of Mobile station roaming number.
COURSE OBJECTIVES

- To introduce the constructs and conventions of the Verilog HDL programming language and various modelling styles supported by the language.
- To distinguish between the various modelling styles like structural, register-transfer (data flow), and algorithmic (behavioral) and make use of various levels of abstraction for modelling simple digital systems.
- To develop advanced required skill set in the verilog programming language to foster the needs of the industry.

UNIT I
Introduction


UNIT II
Gate Level Modelling

Introduction, Gate Types – AND/OR Gates, BUF/NOT Gates, Tri-state Gates, Array of Instances of Gate Primitives, Net Delays and Gate Delays, Rise, Fall and Turn-off Delays, Min/Typ/Max Values, Delay Examples, Strengths and Contention Resolution, Verilog Design Examples Using Gate Level Modelling.

UNIT III
Data Flow and Switch level Modelling:


UNIT IV
Behavioral Modeling

UNIT V
Tasks, Functions and User Defined Primitives (UDPs)
Differences between Tasks and Functions, Declaration and Invocation, Examples, UDP Basics, Combinational UDPS, Sequential UDPS.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, students will
1. Describe the role of hardware description language (HDL) in design flows for FPGA and ASIC with a historical development of the Verilog HDL.
2. Understand basic constructs and conventions of the Verilog HDL
3. Develop program codes in different modelling styles to realize combinational and sequential logic
4. Understand the concepts of Functions, tasks and use it effectively in realizing digital circuits.
5. Interpret and Implement designs using the advanced features of Verilog HDL and be able to write code effectively.
Mapping with Programme Outcomes (POs)

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OPEN ELECTIVES

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COURSE OBJECTIVES

- Artificial Intelligence, Various types of production systems, characteristics of production systems.
- Neural Networks, architecture, functions and various algorithms involved.
- Fuzzy Logic, Various fuzzy systems and their functions.
- Genetic algorithms, its applications.

UNIT I
Artificial Neural Networks


UNIT II
Neural Network Architecture and Algorithms


UNIT III
Fuzzy Logic

UNIT IV
Fuzzy Logic Controller

Fuzzy logic controller: Functional diagram - Fuzzification - Membership value assignments using intuition - Membership functions - Defuzzification: Max-Membership principle - centroid method - weighted average method - Inference Engine - Knowledge Base - Rule base - Case studies

UNIT V
Genetic Algorithm


TEXT BOOKS

REFERENCES

COURSE OUTCOMES
1. Learn about soft computing techniques and their applications.
2. Analyze various neural network architecture.
3. Define the fuzzy systems
4. Analyze the genetic algorithms and their applications.
5. Genetic algorithms, its applications

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COURSE OBJECTIVES

- To understand the principles of satellite and its architecture.
- To learn about the link establishment of satellite.
- To learn to access and different applications of satellite.

UNIT I
Introduction to Satellite Communication

Principles and architecture of satellite Communication, Brief history of Satellite systems, Advantages, disadvantages, applications and frequency bands used for satellite communication. Satellite Construction, Satellite obits, Telemetry, Tracking, command and monitoring (TTC & M), Attitude and orbit control system(AOCS), Communication sub-system, and power sub-systems.

UNIT II
Orbital Mechanics

Kepler's laws, Orbital equations, orbital parameters, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity of a satellite, concepts of Solar day andSidereal day, Eclipse,sub satellite point, sun transit outage Launching procedures and Launch Vehicle.

UNIT III
Satellite Link Design

Basic Transmission theory, satellite uplink and downlink analysis, Calculation of System noise temperature for satellite receiver, noise power calculation, drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions, Propagation characteristics and frequency considerations.

UNIT IV
Access Techniques

Types - FDMA concepts - Inter modulation and back off - SPADE system, TDMA concept - Frame and burst structure, Satellite switched TDMA, CDMA concept - VS and SH CDMA system, Random multiple access techniques – Packet switching, Transmit- Receive Earth stations.

UNIT V
Satellite Services

Fixed satellite services - Broadcast satellite services - Satellite TV systems - Domestic satellite systems(INSAT,INTELSAT series), Mobile satellite services –GSM, Global positioning satellite systems, INMARSAT,VSAT, ATM over satellite, Role of future satellite networks.

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of this course students will demonstrate the ability to
1. Visualize the architecture of satellite systems as a means of high speed, high range communication system.
2. State various aspects related to satellite systems such as orbital equations, Solve numerical Problems related to orbital motion
3. Satellite-link budget, and design of link budget for the given parameters and conditions.
4. Acquiring knowledge on Earth station technology and multiple access schemes.
5. Gather information on different services of satellite.

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COURSE OBJECTIVES
- Able to perform frequency domain analysis for signals.
- To understand the principles and property of various wavelets transform.
- To understand the Biorthogonal wavelet transforms.
- Apply wavelet transform for engineering application.

UNIT I
Signal Representation in Fourier Domain
Fourier series, Orthogonality, Orthonormality and the method of finding the Fourier coefficients Complex Fourier series, Orthonormality of complex exponential bases, Mathematical preliminaries for continuous and discrete Fourier transform, limitations of Fourier domain signal processing.
UNIT II
Introduction to Wavelet Transform
The origins of wavelets, Wavelets and other wavelet like transforms, History of wavelet from Morlet to Daubechies via Mallat, Different communities and family of wavelets, Different families of wavelets within wavelet communities.

UNIT III
Continuous and Discrete Wavelet Transform
Wavelet transform-A first level introduction, Continuous time-frequency representation of signals, Discrete time-frequency representation of signals, Properties of wavelets used in continuous wavelet transform, Properties of wavelets used in discrete wavelet transform Continuous versus discrete wavelet transform.

UNIT IV
Biorthogonal Wavelets
Biorthogonality in vector space, Introduction to Biorthogonal Wavelet Systems, Signal Representation using Biorthogonal Wavelet System, Concepts of Multi-Resolution Analysis (MRA) and Multi-rate signal processing.

UNIT V
Wavelet Packets

TEXT BOOKS

REFERENCES BOOKS

COURSE OUTCOMES
1. Understand Fourier and wavelet transform with its terminology.
2. Apply the concept of wavelets to practical problems.
3. Mathematically analyze the systems or process the signals using appropriate wavelet functions.
4. Understand bi orthogonal wavelets and multirate signal.
5. Design certain classes of wavelets to specification and justify the basis of the Application of wavelet transforms to different fields.

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**COURSE OBJECTIVES**

- To get an overview of different types of power semiconductor devices and their characteristics
- To understand the operation, characteristics and performance parameters of AC-DC converters
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To understand operations of inverters
- To Provide some application oriented knowledge of power electronic devices

**UNIT I**

**Power Semi-Conductor Devices**

Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBT- Treatment should consist of structure- Characteristics- operation-ratings- protections and thermal considerations. Brief introduction to power devices viz. TRIAC- MOS controlled thyristor (MCT)-Power Integrated Circuit (PIC) (Smart Power)- Triggering/Driver- commutation and snubber circuits for thyristor- power MOSFETs and IGBTs (discrete and IC based). Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

**UNIT II**

**AC to DC Converters**

Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R- RL-and RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor- Effect of source impedance- Input current Fourier series analysis of input current to derive input supply power factor-displacement factor and harmonic factor.
UNIT III
DC to DC Converters
Choppers: Quadrant operations of Type A- Type B- Type C- Type D and type E choppers- Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper-Multiphase Chopper

UNIT IV
Inverters

UNIT V
Power Electronic Applications

TEXT BOOKS
1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.

REFERENCES

COURSE OUTCOMES
Students will be able to
1. Design power devices
2. Analyze various load characteristics of AC-DC converter
3. Analyze various load characteristics of DC-AC converter
4. Effectively handle inverters utility in the circuit
5. Have an thorough exploration about power electric applications

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COURSE OBJECTIVES

- To understand the principles of RADAR, Equations and its concepts
- To learn about the different types of RADAR on different applications.
- To understand the systems of Navigation Aids

UNIT I
Basic concepts and Radar Equations

Introduction to RADAR, Basic Radar block diagram and operation, simple form of Radar equation - Bi-Static Radar equation, Radar Frequencies, Applications of Radar. Detection of Signals in Noise, Receiver Noise and Signal to noise ratio, Radar cross section of targets, pulse repetition frequency and range ambiguities, Radar system losses.

UNIT II
CW, FMCW and MTI Radar

Doppler Effect – Simple CW Doppler Radar block diagram and operation, basic principles and operation of Frequency Modulated CW Radar (FMCW).
MTI Radar Block diagram – Delay line cancellers – Multiple or Staggered Pulse repetition frequency - Digital MTI Processing, Pulse Doppler Radar.

UNIT III
Tracking Radar


UNIT IV
Radar Clutter and Basic Navigational Radar system


UNIT V
Advanced Navigational system

Hyperbolic system of Navigation – Loran (Long Range Navigation) and Decca navigation system- DME (Distance Measurement Equipment) and TACAN (TACTical Air Navigation). Omega Navigation system - Satellite navigation system – Navstar Global positioning system.

TEXT BOOKS

REFERENCES BOOKS
COURSE OUTCOMES

On completion of this course, the students will be able to
1. Acquire knowledge in the basics of RADAR and its applications.
2. Have a knowledge about different types of RADAR and techniques used.
3. Understand the problem to reduce interference and natural effects.
4. Know the basics of Navigational Aids.
5. Different types of Navigation System.

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ECOESCN NETWORK AND INFORMATION SECURITY

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COURSE OBJECTIVES

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks.
- To design security applications in the field of Information Technology.

UNIT I

Introduction


UNIT II

Symmetric Key Algorithms

Algorithms types and modes, Overview of Symmetric key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), RC4, RC5, Blowfish, Advanced Encryption Standard (AES), Differential and linear cryptanalysis, hash functions.
UNIT III
Public Key Cryptosystems
Brief history of Asymmetric Key Cryptography, Overview of Asymmetric Key Cryptography, RSA algorithm, Knapsack Algorithm, Elliptic curve cryptography, ElGamal, key management, Diffie Hellman key exchange and generation, Digital Signatures and authentication protocols-DSS.

UNIT IV
Security Practice and System Security

UNIT V
Wireless Network Security

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon Completion of the course, the students will be able to
1. Implement basic security algorithms required by any computing system
2. Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
3. Analyze the possible security attacks in complex real time systems and their effective countermeasures
4. Analyze security threats related to wireless network.
5. Design a simple secure cryptosystem for an application.
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**COURSE OBJECTIVE**
- Gives the idea of evolution of cloud computing
- Provides knowledge about its services available today
- Helps to the design and development of simple cloud service.
- Focused on some key challenges and issues around cloud computing.

**UNIT I**

**Introduction**

**UNIT II**

**Cloud Services**
Types of Cloud Services: Software as a Service - Platform as a Service - Infrastructure as a Service - Database as a Service - Monitoring as a Service - Communication as Services. Service Providers - Google, Amazon, Microsoft Azure, IBM, Sales Force.

**UNIT III**

**Collaborating Using Cloud Services**

**UNIT IV**

**Virtualization for Cloud**
Need For Virtualization – Pros And Cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine Monitor – Virtual Machine Properties - Interpretation And Binary Translation, HLL VM - Hypervisors – Xen, KVM , Vmware, Virtual Box, Hyper-V.
UNIT V
Security, Standards and Applications

Security in Clouds: Cloud Security Challenges – Software as a Service
Security, Common Standards: The Open Cloud Consortium – The Distributed
Management Task Force – Standards for Application Developers – Standards for
Internet Devices and The Cloud.

TEXT BOOKS
1. John Rittinghouse & James Ransome, Cloud Computing, Implementation,
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the

REFERENCES
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud
computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-
demand Computing, Applications and Data Centers in the Cloud with SLAs,
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation

COURSE OUTCOMES
Upon Completion of the course, the students will be able to
1. Understand clearly about the introduction of cloud computing
2. Acquired knowledge about its services
3. Design and development of simple cloud service.
4. Implement Practical applications using cloud
5. Gain knowledge on some key challenges and issues around cloud computing.

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COURSE OBJECTIVES

- Students will get an introduction about ISDN layers and its protocol,
- To comprehend the concepts of SS7, Frame relay and Broadband ISDN,
- To understand the concepts of ATM network and architecture,
- To learn the modern Mobile communication system.

UNIT I
ISDN Overview and Physical Layer

A conceptual view of ISDN - ISDN standards - service capabilities — . ISDN interfaces and function: transmission structure - user network interface configuration - ISDN protocol architecture - ISDN connection - terminal adaptation - addressing - interworking. ISDN physical layer: basic user network interface - primary user role network interface.

UNIT II
ISDN Datalayer and Network Layer

ISDN data layer: LapD, Terminal adaption - bearer channel link control using I.465/v.120. ISDN network layer: Basic call control- ISDN supplementary services. Signaling system 7: SS7 architecture, signaling data link level - signaling network link level - signaling connection control part - ISDN user part.

UNIT III
Frame Relay and Broadband ISDN


UNIT IV
ATM Network Concepts and Architecture

ATM cell and its structure –Transmission of ATM cells- ATM architecture, ATM Signaling –ATM switching –ATM interfaces- ATM traffic and congestion control, ATM operation, administration and maintenance.

UNIT V
Mobile Communication Systems


TEXT BOOKS


REFERENCES

COURSE OUTCOMES
At the end of this course the students will have wide knowledge on
1. ISDN layers and its protocol,
2. Signaling system 7
3. Frame relay and BISDN,
4. ATM Networks and architecture,
5. Mobile communication systems.

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ECOESCN: MULTIMEDIA COMPRESSION TECHNIQUE

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COURSE OBJECTIVES

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

UNIT I
Introduction
Overview of information theory, redundancy - Taxonomy of compression techniques - Overview of source coding, source models, Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, scalar quantization, vector quantization, rate distortion theory, structure quantizers - Evaluation techniques-error analysis and methodologies.

UNIT II
Text Compression

UNIT III
Audio Compression
Audio compression techniques-frequency domain and filtering-basic sub band coding-application to speech coding-G.722-application to audio coding-

MPEG audio, progressive encoding for audio - Silence compression, Speech compression techniques - Vocoders.
UNIT IV
Image Compression

UNIT V
Video Compression
  Video signal representation - Video compression techniques-MPEG, Motion estimation techniques- Overview of Wavelet based compression and DVI technology, Motion video compression - PLV performance - DVI real time compression.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
  Upon Completion of the course, the students will be able to
1. Describe various multimedia compression parameters.
2. Describe compression and decompression techniques for text.
3. Analyze various compression techniques available for Image.
4. Discuss in detail about various audio and video compression techniques.
5. Apply the compression concepts in multimedia communication

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Mapping with Programme Outcomes (POs)
COURSE OBJECTIVES
1. To expose the students to the fundamentals of microprocessor architecture.
2. To introduce the advanced features in microprocessors and microcontrollers.
3. To enable the students to understand various microcontroller architectures.

UNIT I
High Performance CISC Architecture – Pentium

UNIT II
High Performance RISC Architecture – ARM

UNIT III
ARM Application Development

UNIT IV
Motorola 68HC11 Microcontrollers
   Instruction set addressing modes – operating modes- Interrupt system- RTC- Serial Communication Interface – A/D Converter, PWM and UART.

UNIT V
PIC Microcontroller

TEXT BOOKS

REFERENCES

**COURSE OUTCOMES**

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

1. Understand the architecture and programming of High performance CISC processor (Pentium)
2. Understand the architecture and programming of High performance RISC processor (ARM).
3. Digital Signal Processing application development in ARM processor.
4. Obtain programming and interfacing knowledge in Motorola 68HC11 Microcontrollers.
5. Attain programming and interfacing knowledge in PIC Microcontrollers.

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**COURSE OBJECTIVES**

- To introduce basic concepts of transmission lines
- To learn the characteristics of low and radio frequency lines
- To study various impedance matching devices
- To learn Smith chart and its applications in transmission line problems
- To design passive filters attenuators, and equalizers
- To study waveguide theories

**UNIT I**

**Transmission Line Theory**

Electrically short and long line concepts with distributed constants – Transmission line equation – Infinitive line. Transmission, reflection coefficient and standing wave ratio. Input and transfer impedance - Open and Short circuited lines – Reflection factor and reflection loss.

**UNIT II**

**Low Frequency Transmission Lines**

Characteristics, distortion, condition for distortion less transmission – Loading – Lumped and distributed loading - Measurement of USWR, wave length, characteristic impedance, propagation constant and primary constants.
UNIT III
Radio Frequency Transmission Lines
Characteristics, parameter of open wire line and co-axial lines at radio frequencies – Standing waves, input impedances of a line terminated with a complex load – Transmission line as resonant circuit and reactive elements. Skin depth and promily effect – Equivalent T and TT models. Impedance matching quarter wave transformer – Single and double stub matching – circle diagram, smith chart and its uses.

UNIT IV
Circular and Rectangular Wave Guides
Wave between parallel planes – TE, TM and TEM waves and characteristics – Attenuation in parallel plane guide for TE, TM and TEM, waves – Wave impedance and characteristics impedances – Excitation methods for various modes for rectangular and circular wave guides – Impossibility of TEM, waves in wave guides – TE and TM waves in rectangular and circular wave guides – Transmission line analogy for wave guides – Attenuation factor and Q-factor of wave guides.

UNIT V
Wave Guides Elements

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completion of the course the students will be able to
1. Understand the fundamentals of transmission lines
2. Understand loading concepts in cables
3. Explain the need for impedance matching in radio frequency lines
4. Analyze and design various network elements(filters, attenuators and equalizers)
5. Explain propagation of EM waves in rectangular and circular waveguides.
### Course Objectives

- To introduce MOSFET physics and various MOS models.
- To introduce various sub-circuits used in analog ICs.
- To study the characteristics of noise and frequency response of the amplifier.
- To learn the concepts of Op-Amp frequency compensation, capacitor switches, and PLLs.

### Course Objectives

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### UNIT I

**Introduction**


### UNIT II

**CMOS Sub circuits**

MOS Switch – MOS Diode/Active Resistor – Current Sinks and Sources – Current Mirrors – Current and Voltage References – Temperature-Independent References.

### UNIT III

**CMOS Amplifiers**


### UNIT IV

**CMOS Operational Amplifiers**

UNIT V
Switched Capacitor Circuits and PLLs

General Considerations- Sampling switches- Switched Capacitor Amplifiers-Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL- Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, students will
1. Demonstrate an understanding of characteristics and working of MOS Transistors.
2. Design and analyse various analog CMOS Sub circuits.
3. Realize the various configurations of CMOS amplifiers and explain their frequency response and noise characteristics.
4. Analyze the performance of Two stage Op-amp and explain compensation techniques used in Op-amp.
5. Construct Switched capacitor circuits and PLLs.

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COURSE OBJECTIVES
- To learn the methodical way of solving complex problems
- To understand the different methods of organizing large amounts of data
- To efficiently implement graphical programs
- To learn and develop skills in C++ programming

UNIT I
Linear Data Structures
Introduction to data structures, Primitive and non-primitive data structures, Arrays in C -types, Structures in C, Stack-implementation, operations, Queues-operations-Lists-Linked list-types, Applications.
UNIT II
Non Linear Data Structures

Tree - Binary tree-representation - Tree traversal techniques- Graph-representation, traversal-Sorting- Selection Sorting, Insertion sorting, Merge sorting, Radix sorting, Searching -techniques - Hashing.

UNIT III
Object Oriented Programming

Object Oriented Programming concepts- Objects- classes – methods and message passing, encapsulation, abstraction, inheritance, polymorphism and dynamic binding-characteristics of OOPS-benefits of object orientation. Introduction to C++ and data types-Operators in C++.

UNIT IV
Objects and Classes

Objects and class -defining a class –defining member functions-Private and public member function–accessing class members, creating objects, object as function arguments- Array fundamentals - array within a class - array of objects. Constructors and destructors- Function overloading - Inline function - Virtual function.

UNIT V
File and Graphics Operations

Operator overloading – overloading unary, binary and relational operators-type conversion, Inheritance- derived class and base class-visibility mode-public, private and protected–various forms of inheritance. C++ graphics - text mode graphics functions- graphics mode graphics functions - colors –drawing shapes- Address and pointers-Files and streams.

TEXT BOOKS

REFERENCES
COURSE OUTCOMES

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

1. Understand basic data structures such as arrays, linked lists, stacks and queues in C.
2. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data in C and C++.
3. Able to use object oriented programming language like C++ and associated libraries to develop object oriented programs.
4. Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
5. Choose appropriate data structure as applied to specified problem definition.

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COURSE OBJECTIVES

The objective of this subject is to make the student learn and understand

- Speech signal representations.
- Models for speech production system.
- Models for speech perception system.
- Fundamentals of speech coding.
- Fundamentals of speech recognition
- Fundamentals of text-to-speech synthesis

UNIT I

Introduction

Introduction - Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid; Requirements of speech codecs – quality, coding delays, robustness. Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

UNIT II

Linear Prediction of Speech

Basic concepts of linear prediction; Linear Prediction Analysis of non stationary signals, prediction gain, examples; Levinson-Durbin algorithm; Long term and short term linear prediction models; Moving average prediction.

UNIT III

Speech Quantization

Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers, Vector quantization – Distortion Measures, codebook design, codebook types. Scalar Quantization of LPC-Spectral distortion measures, Quantization based on reflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF.
UNIT IV

**Linear Prediction Coding:** LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model.

**Code Excited Linear Prediction:** CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero-input zero-state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP.

UNIT V

**Coding Standards**


**TEXT BOOKS**


**REFERENCES**

2. Speech and Audio Processing by Dr. shaila B.Apte Wiley Edition 2012.

**COURSE OUTCOMES**

At the end of the course, students will demonstrate the ability to

1. Mathematically model the speech signal.
2. Analyze the quality and properties of speech signal.
3. Modify and enhance the speech and audio signals.
4. Properties of speech production and perception system.
5. Fundamental algorithms for speech synthesis, coding and recognition.

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**COURSE OBJECTIVES**

- To introduce some practical aspects of signal processing, and in particular adaptive systems.
- To gain knowledge in Current applications for adaptive systems which include in the field of communications, radar, sonar, seismology, navigation systems and biomedical engineering.
- To understand the basic principles of adaptation
- To cover various adaptive signal processing algorithms (e.g., the LMS algorithm) and many applications, such as adaptive noise cancellation, interference canceling, system identification, etc.
UNIT I
Basic Concepts
General concept of adaptive filtering and estimation, applications and motivation, Review of probability, random variables and stationary random processes, Correlation structures, properties of correlation matrices.

UNIT II
LMS Algorithm
Optimal FIR (Wiener) filter, Method of steepest descent, extension to complex valued. The LMS algorithm (real, complex), convergence analysis, weight error correlation matrix, excess mean square error and mis-adjustment. Variants of the LMS algorithm: the sign LMS family, normalized LMS algorithm, block LMS and FFT based realization, frequency domain adaptive filters, Sub-band adaptive filtering.

UNIT III
Signal Space Concepts
Signal space concepts - Introduction to finite dimensional vector space theory, subspace, basis, dimension, linear operators, rank and nullity, inner product space, orthogonality, Gram-Schmidt orthogonalization, concepts of orthogonal projection, orthogonal decomposition of vector spaces.

UNIT IV
Vector space
Vector space of random variables, correlation as inner product, forward and backward projections, Stochastic lattice filters, recursive updating of forward and backward prediction errors, relationship with AR modeling, joint process estimator, gradient adaptive lattice.

UNIT V
Recursive Least Squares
Introduction to recursive least squares (RLS), vector space formulation of RLS estimation, pseudo inverse of a matrix, time updating of inner products, development of RLS lattice filters, RLS transversal adaptive filters. Advanced topics: affine projection and subspace based adaptive filters, partial update algorithms, QR decomposition and systolic array.

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Examine and derive the FIR Wiener filter
2. Apply the RLS algorithm.
3. Recognise the prediction filter formulation and applications
4. Solve the Wiener filter weights for the prediction filter using the Levinson-Durbin algorithm
5. Use Matlab to implement the Wiener filter, Least Squares, LMS and RLS algorithms, and apply to selected applications.

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COURSE OBJECTIVES
- To study the basics of mobile communication networks and its generation.
- To understand the concepts of advanced network concepts.
- To study the basics of various receiver characteristics.

UNIT I
Cellular Concepts
Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, System capacity, wireless standards: Overview of 2G and 3G cellular standards.

UNIT II
Signal propagation
Propagation mechanism-reflection, refraction, diffraction and scattering, large scale signal propagation, fading channels-multipath and small scale fading-Doppler shift, narrowband and wideband fading models, delay spread, coherence bandwidth and coherence time, frequency selective fading, slow and fast fading, capacity of flat and frequency selective channels. Antennas-Antennas for mobile terminal, base station antennas and arrays.

UNIT III
Multiple access schemes
FDMA, TDMA, CDMA and SDMA. Modulation schemes-BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.

UNIT IV
Receiver structure
Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme.

UNIT V
MIMO and space time signal processing
Spatial multiplexing, diversity/multiplexing Tradeoff. Performance measures-Outage, average SNR, average symbol/bit error rate. System Examples-GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

TEXT BOOKS
REFERENCES

COURSE OUTCOMES
At the end of the course, students will demonstrate the ability to:
1. Understand the working principles of the mobile communication systems.
2. Understand the relation between the user features and underlying technology.
3. Analyze mobile communication systems for improved performance.
4. Understand the Equalization Techniques and Receiver types.
5. Understand the diversity Techniques and System Examples.

MINOR ENGINEERING

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<th>ECMISCN</th>
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COURSE OBJECTIVES
Students will try to learn:
- To understand operation of semiconductor devices.
- To understand DC analysis and AC models of semiconductor devices.
- To apply concepts for the design of Regulators and Amplifiers
- To verify the theoretical concepts through laboratory and simulation experiments.
- To implement mini projects based on concept of electronics circuit concepts.

UNIT I
Introduction to Semiconductor Physics
Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors.

UNIT II
P-N junction
Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-Vcharacteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode.

UNIT III
Bipolar Junction Transistor
Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model, MOS capacitor, C-V characteristics.

UNIT IV
MOSFET and Optoelectronic devices
MOSFET, I-V characteristics, and small signal models of MOS transistor, LED, photodiode and solar cell.
UNIT V
Integrated circuits
Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of this course students will demonstrate the ability to
1. Understand the principles of semiconductor Physics
2. Understand the current voltage characteristics of semiconductor devices
3. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
4. Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation.
5. Design and analyze of electronic circuits.

COURSE OBJECTIVES
- To give an exposure of different types of analog modulation techniques and their significances in communication systems.
- To familiarize the students about digital modulation techniques in communication systems.
- To introduce the concepts of Pulse Code Modulation techniques and multiple access techniques used in communication systems for enhancing the number of users.
- To focus on various media for digital communication and future data communication.
UNIT I
Linear Modulation / Demodulation

Need for modulation - Amplitude modulation - Power spectrum - Power relation - Different types of modulation - Double sideband suppressed carrier. (DSB/SC), Single sideband suppressed carrier (SSB) and Vestigial sideband (VSB) generation. AM transmitters - Block diagram - Amplitude demodulation - Detection of DSB, SSB signals - Receiver characteristics - Super heterodyne reception - Automatic volume control.

UNIT II
Angle Modulation

Principle of frequency and phase modulation - Generation of FM and PM signals - Direct and indirect methods - FM transmitters - Block diagram – Pre-emphasis circuit - Frequency demodulation - Detection of FM and PM signals - Automatic frequency control - De-emphasis circuit.

UNIT III
Pulse Modulation

Analog and digital communication systems and techniques: Pulse modulation systems - Sampling theorem - Pulse amplitude modulation - Channel bandwidth - Detection of PAM signals - Cross talk in PAM signals - Pulse time modulation - Generation of PDM and PPM - Conversion of PDM to PPM - Detection of PTM signals - Cross talk in PTM signals.

UNIT IV
Pulse Code Modulation Systems

Quantization - Compounding - Pulse code modulation - Sampling and digitizing - Aliasing - Sample and hold circuit - Practical implementation of sampling and digitizing - Equalization - Multiplexing - Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) - Data communications - Serial synchronous, asynchronous communication protocol - Hardware USARTS - Software USART.

UNIT V
Wireless Communication Systems

Evolution of generations (1G, 2G, 2.5, 3G, 4G and beyond 4G), - GSM and CDMA systems-cellular structure-frequency reuse-Handoff-Bluetooth and UWB network-Wi-Fi and Wi-Max. (Quantitative treatment only)

TEXT BOOKS

REFERENCES


**COURSE OUTCOMES**
1. Provide idea about modulation and demodulation techniques employed in communication systems.
2. Explain the concepts of pulse modulation systems and multiple access techniques used in communication field applications.
3. Understand the various broadband communication systems and recent advancements in communication systems.
4. To analyze the concepts of Pulse Code Modulation techniques and multiple access techniques used in communication systems for enhancing the number of users.
5. To focus on various media for digital communication and future data communication.

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**COURSE OBJECTIVES**

The student is expected to have the knowledge about
- Working of operational amplifiers and various applications of op-amp such as Multivibrators, Oscillators and filters.
- The theory of ADC and DAC and the concepts of waveform generation and some special Function ICs.
- Micro fabrication techniques of optical integrated circuits and optical wave guides, opto electronic integrated circuits.

**UNIT I**

**Introduction to Linear IC’S**


**UNIT II**

**Applications of Op – Amp**


**UNIT III**

**Active Filters & Oscillators**

UNIT IV
Comparators and Converters
Basic Comparator: Comparator characteristics - Zero Crossing Detector – Schmitt Trigger – high speed and precision type comparators - window Detector – Voltage to Frequency converter - Frequency to Voltage converter - D/A converters - A/D Converters - Clippers and Clampers – positive and negative clippers – small-signal and half-wave rectifier – positive and negative clampers - Peak Detector – sample and hold circuit.

UNIT V
Waveform Generators and Other Linear IC’S

TEXT BOOKS

REFERENCES

COURSE OUTCOMES
Upon completion of the course the students will
1. Gain knowledge of IC fabrication
2. Have an in depth knowledge of applications of op – amps
3. Design different types of active filters and oscillators and acquire knowledge about comparators and converters
5. Analyse special function ICs like 555 Timer.

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COURSE OBJECTIVES
- To understand the concept of network architecture and protocols
- To understand the division of network functionalities into layers.
- To be familiar with the components required to build different types of networks.
- To be exposed to the required functionality at each layer
- To learn the flow control and congestion control algorithms
UNIT I
Introduction to computer networks and the Internet
   Application layer: Principles of network applications, The Web and Hyper Text Transfer Protocol, File transfer, Electronic mail, Domain name system, Peer-to-Peer file sharing, Socket programming, Layering concepts.

UNIT II
Switching in networks
   Classification and requirements of switches, a generic switch, Circuit Switching, Time-division switching, Space-division switching, Crossbar switch and evaluation of blocking probability, 2-stage, 3-stage and n-stage networks, Packet switching, Blocking in packet switches, Three generations of packet switches, switch fabric, Buffering, Multicasting, Statistical Multiplexing.

UNIT III
Transport layer

UNIT IV
Congestion Control and Resource Allocation
   Issues in Resource Allocation, Queuing Disciplines, TCP congestion Control, Congestion Avoidance Mechanisms and Quality of Service.

UNIT V
Network layer
   Virtual circuit and Datagram networks, Router, Internet Protocol, Routing algorithms, Broadcast and Multicast routing Link layer: ALOHA, Multiple access protocols, IEEE 802 standards, Local Area Networks, addressing, Ethernet, Hubs, Switches.

TEXT BOOKS

REFERENCES
COURSE OUTCOMES
At the end of this course students will demonstrate the ability to:
1. Understand the concepts of networking thoroughly.
2. Design a network for a particular application.
3. Analyze the performance of the network.
4. Analyze about the layered architecture.
5. Able to provide solutions to various issues in routing and congestion.

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COURSE OBJECTIVES
- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.

UNIT I
Multiplexing

UNIT II
Digital Switching
Switching Functions, Space Division Switching, Time Division Switching, two dimensional switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling.

UNIT III
Network Synchronization Control and Management Timing
UNIT IV
Digital Subscriber Access ISDN


UNIT V
Traffic Analysis


TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course, the student should be able to
1. To understand the concepts of Frequency and Time division multiplexing.
2. To analyze digital multiplexing and digital hierarchy namely SONET / SDH
3. To discuss the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
4. To explain the statistical modeling of telephone traffic, blocking system characteristics and queuing system characteristics.
5. To examine blocking probability holding service time distributions for in speech and data networks.
COURSE OBJECTIVE

- To acquire knowledge of Wireless channels and parameters
- To impart knowledge on mobile communication and cellular system architecture
- To understand various Modulation Techniques used in wireless communication.
- To create exposure to multipath mitigation techniques and wireless standards

UNIT I

Wireless Channels


UNIT II

Fundamentals of Cellular Communication


UNIT III

Modulation Techniques


UNIT IV

Multipath Mitigation Techniques

Equalization – Adaptive Equalization, Linear and Non - Linear equalization, Zero forcing and LMS Algorithms, Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception.

UNIT V

Mobile Communication Systems

Overview of AMPS - DECT - CT2 - PACS - PHS - International Mobile Telecommunication 2000 - GSM Architecture - USSD - GPRS - EDGE - IS95, CDMA 2000 - WCDMA - UMTS - HSPDA - Bluetooth - WIFI - WIMAX - Introduction to LTE.
TEXT BOOKS

REFERENCES

COURSE OUTCOMES
At the end of the course student will
1. Characterize Wireless Channels
2. Explain the basic concepts of Cellular Systems.
3. Design and Implement various Modulation schemes for fading channels
4. Compare Multipath Mitigation techniques and analyze their performance
5. Acquire knowledge on Various Wireless Standards.