

Chameli Devi Group of Institutions, Indore
Department of Electronics & Communication Engineering

Semester	Course Code	Course Name	Course Outcome
III	BT 301	Mathematics-III	CO301.1: Students will be able to execute effective mathematical tools to solve numerically algebraic and transcendental equations. Also explain various interpolation methods by using finite difference operators.
			CO301.2: Students will be able to examine differentiation and integration by interpolation methods. Also discuss various numerical techniques to solve simultaneous linear algebraic equations
			CO301.3: Students will be able to implement various mathematical tools to solve ordinary and partial differential equations.
			CO301.4: Student will be able to identify importance of Laplace Transform, Inverse Laplace Transform and Fourier transform
			CO301.5 • Student will be able to analyse the concepts of probability density, distribution function and also to understand the Discrete and Continuous probability distributions.

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Semester	Course Code	Course Name	Course Outcome
III	EC 302	Electronic Instrumentation & Measurement	CO302.1. Students will be able to identify and evaluate different types of Errors in measurements.
			CO302.2. Students will be able to discuss working of CRO, and examine the values of unknown elements in bridge circuitry.
			CO302.3- Student will be able to classify and explain working principle of different types of transducers.
			CO302.4- Students will be able to demonstrate functioning of different signal generators and display devices.
			CO302.5- Students will be able to discuss different types of ADC and DAC techniques used in measuring instruments.

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Semester	Course Code	Course Name	Course Outcome
III	EC 303	Digital System Design	CO303.1 - Students will be able to state the basic laws of Boolean algebra, and apply them to solve the logical problems
			CO303.2 - Students will be able to design and implement the arithmetic operations using combinational logic circuits.
			CO303.3 -Students will be able to explain the basic operation of sequential logic and implement the sequential circuits.
			CO303.4 -Students will be able to implement registers and counters using sequential components.
			CO303.5 -Students will be able to distinguish different types of logic families

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Semester	Course Code	Course Name	Course Outcome
III	EC 304	Electronic Devices	CO1: Students will be able to describe the properties of semiconductor material and PN junction.
			CO2: Students will be able to implement wave shaping circuits using the concept of diode operations.
			CO3: Students will be able to explain the operation of BJT and examine its behavior in various biasing techniques.
			CO4: Students will be able to sketch and examine working of BJT for small and large signal analyses.
			CO5: Student will be able to explain construction and working principle of different solid state devices.

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Semester	Course Code	Course Name	Course Outcome
III	EC 305	Network Analysis	CO305.1 -Student will be able to state Kirchoff's laws to solve the electrical circuit problems.
			CO305.2 -Student will be able to explain the graph theory, its application.
			CO305.3 -Student will be able to state different network theorems to solve problems for dependent and independent sources.
			CO305.4 -Student will be able to examine transient response of circuits and implement Laplace transform to solve complex problems.
			CO305.5 -Student will be able to interpret two port network parameters to relate conditions for reciprocity and symmetry.

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Semester	Course Code	Course Name	Course Outcome
IV	EC 402	Signals & Systems	CO402.1- Students will be able to define and classify signals and systems with different operations on signals.
			CO402.2- Students will be able to examine the linear time invariant systems and sketch the block diagram of system in different forms.
			CO402.3- Students will be able to solve discrete time system using Z-transform
			CO402.4- Students will be able to interpret discrete time sigals using Fourier series and transform.
			CO402.5- Students will be able to describe the state space analysis method and define the sampling theorem.

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Semester	Course Code	Course Name	Course Outcome
IV	EC 403	Analog Communication	CO403.1 -Student will be able to define and analyze the frequency spectrum using Fourier transform.
			CO403.2 -Student will be able to explain different amplitude modulation techniques.
			CO403.3 -Student will be able to explain various angle modulation techniques.
			CO403.4 -Student will be able to list and interpret the working principle of AM transmitters and receivers.
			CO403.5 -Student will be able to classify and examine the concepts of noise in transmission.

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Semester	Course Code	Course Name	Course Outcome
IV	EC 404	Control System	CO404.1 -Student will be able to define and analyze control system by using block diagram reduction and signal flow graph techniques.
			CO404.2 -Student will be able to analyze the time response of Control Systems and identify stability in time domain.
			CO404.3 -Student will be able to analyze the control systems in frequency domain using various methods.
			CO404.4 -Student will be able to design and compare various compensation techniques.
			CO404.5 -Student will be able to analyze control systems using state space technique.

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Semester	Course Code	Course Name	Course Outcome
IV	EC 405	Analog Circuits	CO405.1 -Students will be able to explain the concept of feedback in amplifiers and oscillators and their types.
			CO405.2 -Students will be able to use data sheet of an IC and discuss various configurations of differential amplifier.
			CO405.3 -Students will be able to describe various practical parameters of operational amplifier.
			CO405.4 -Students will be able to discuss and analyze the various applications of operational amplifier.
			CO405.5 -Students will be able to describe and examine the concept of IC555 Timer and voltage regulator.

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Semester	Course Code	Course Name	Course Outcome
IV	ES 401	Energy and Environmental Engineering	CO401.1 -After studying the content scholar will able to compare and differentiate about available energy systems, Energy sources and possible future options based on demand and supply.
			CO401.2 - After studying the content, students will be able to identify the various segments of environment and ecosystem, which will help them to be a better engineer and serve the society in a positive manner
			CO401.3 - After studying the content students will be able to compare and value the Bio-geography of India, Biodiversity of the country, Threats to biodiversity and its conservation.
			CO401.4 - After studying the content scholar will able to identify and examine the sources of pollution, types, solution for the issue and impact on the society.
			CO401.5 - After studying the content students will be able to identify and construct solutions for the issues related to society like energy, climate change and water availability, its harvesting, Issues involved in enforcement of environmental legislation, and public awareness.

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Semester	Course Code	Course Name	Course Outcome
V	EC 501	Microprocessor and Its Applications	CO501.1 Students will be able to explain the concept of microprocessor architecture, modes of operation and memory organization.
			CO501.2 Students will be able to list the instruction set, tools for execution of assemble language programs.
			CO501.3 Students will be able to explain the methods of interfacing the peripheral devices with the microprocessor and examine their modes of operation.
			CO501.4 Students will be able to describe the mechanism of interrupts and interrupt service routine.
			CO501.5 Students will be able to sketch the microcontroller architecture and select appropriate instructions for microcontroller programming.

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Semester	Course Code	Course Name	Course Outcome
V	EC 502	Digital Communicatio n	CO502.1 Students will be able to explain different techniques of digitalization of analog signals and its transmission.
			CO502.2 Student will be able to understand the pulse coding and encoding techniques.
			CO502.3 Students will be able to analyze the different digital transmission techniques and compare them.
			CO502.4 Students will be able to analyze the methods to reduce inter symbol interference and explain optimum reception of digital signals.
			CO502.5 Students will be able to explain principles of information theory to implement

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Semester	Course Code	Course Name	Course Outcome
V	EC 503	Mobile Communication	CO503.1 Student will be able to design and create traditional networks.
			CO503.2 Student will be able to understand the different issues in MAC and routing issues in multi hop wireless and ad-hoc networks and existing solutions for the same.
			CO503.3 Evaluate the transport layer issues in wireless networks due to error's and mobility of nodes and understand existing solutions for the same.
			CO503.4 Explain the architecture of GSM.
			CO503.5 Discuss the services, emerging issues and future trends in M-Commerce.

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Semester	Course Code	Course Name	Course Outcome
V	EC 504	Computer System Organization	CO504.1 -Students will be able to sketch Von Newman model and explain basic computer operations.
			CO504.2 -Students will be able to explain control unit and ALU operations.
			CO504.3 -Students will be able to examine the concepts of I/O organization and data transmission.
			CO504.4 -Students will be able to describe memory organization and mapping.
			CO504.5 -Students will be able to explain pipeline and vector processing.

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Semester	Course Code	Course Name	Course Outcome
VI	EC 601	Digital Signal processing	CO601.1: Students will be able to analyse and implement linear time invariant systems in time domain.
			CO601.2: Students will be able to examine linear time invariant systems using Z- Transform
			CO601.3: Students will be able to examine the systems using discrete fourier series and transforms
			CO601.4: Students will be able to define and implement different FFT algorithms.
			CO601.5: Students will be able to design IIR and FIR filters using windowing techniques.

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Semester	Course Code	Course Name	Course Outcome
VI	EC 602	Antenna and Wave Propagation	CO602.1: Students will be able to apply the knowledge of electromagnetic field theory to discuss the various properties of the antenna.
			CO602.2: Students will be able to describe the fundamentals of Antenna and sketch radiation their patterns.
			CO602.3: Students will be able to list various types of antennas and their applications.
			CO602.4: Students will be able to analyze antenna array using different synthesis techniques.
			CO602.5: Students will be able to analyse the principles of wave propagation and their types.

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Semester	Course Code	Course Name	Course Outcome
VI	EC 603	CMOS Design	CO603.1: Students will be able to explain the simple design flow of a MOS transistor and develop circuits using NMOS and PMOS transistors.
			CO603.2: Students will be able to realize the state table and various approaches to minimize the state table of synchronous sequential machines.
			CO603.3: Students will be able to explain the fundamental and pulse mode of operation as well as identifying races and hazards of asynchronous sequential machines.
			CO603.4: Students will be able to define & implement the terminologies associated with the VLSI design.
			CO603.5: Students will be able to sketch the DC and AC models of MOSFET for large & small signal analysis.

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Semester	Course Code	Course Name	Course Outcome
VI	EC 604	Microcontroller & Embedded system	CO604.1: Student will be able to interface the ADC/DAC, stepper motor and concept of serial communication.
			CO604.2: Student will be able to understand the architecture of 16-bit microcontroller.
			CO604.3: Student will be able to classify the embedded system.
			CO604.4: Student will be able to define different embedded processor architecture.
			CO604.5: Student will be able to configure the timer/counters.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VII-Semester

EC- 701 VLSI Design

Course Objective:

- To understand the fabrication process of CMOS technology.
- To teach fundamentals of VLSI circuit design and implementation using circuit simulators and layout editors.
- To study various problems due to VLSI technology advancement.
- To study digital circuits using various logic methods and their limitations.
- To highlight the circuit design issues in the context of VLSI technology.

Course Contents:

UNIT I

Practical Consideration and Technology in VLSI Design

Introduction, Size and complexity of Integrated Circuits, The Microelectronics Field, IC Production Process, Processing Steps, Packaging and Testing, MOS Processes, NMOS Process, CMOS Process, Bipolar Technology, Hybrid Technology, Design Rules and Process Parameters.

UNIT II

Device Modeling

Dc Models, Small Signal Models, MOS Models, MOSFET Models in High Frequency and small signal, Short channel devices, Sub threshold Operations, Modeling Noise Sources in MOSFET's, Diode Models, Bipolar Models, Passive component Models.

UNIT III

Circuit Simulation

Introduction, Circuit Simulation Using Spice, MOSFET Model, Level 1 Large signal model, Level 2 Large Signal Model, High Frequency Model, Noise Model of MOSFET, Large signal Diode Current, High Frequency BJT Model, BJT Noise Model, temperature Dependence of BJT.

UNIT IV

Structured Digital Circuits and Systems

Random Logic and Structured Logic Forms, Register Storage Circuits, Quasi Static Register Cells, A Static Register Cell, Micro coded Controllers, Microprocessor Design, Systolic Arrays, Bit-Serial Processing Elements, Algotronix.

UNIT V

CMOS Processing Technology

Basic CMOS Technology, A Basic n-well CMOS Process, Twin Tub Processes, CMOS Process Enhancement, Interconnects and Circuit Elements, Layout Design Rules, Latch up, Physical Origin, Latchup Triggering, Latch up Prevention, Internal Latch up Prevention Techniques.

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

- Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
- Design MOSFET based logic circuit
- Draw layout of a given logic circuit
- Demonstrate an understanding of working principle of operation of different types of memories
- Demonstrate an understanding of working principles of clocking, power reduction and Distribution

References:

1. Geiger, Allen and Strader: VLSI Design Techniques for Analog and Digital Circuits, TMH.
2. Sorab Gandhi: VLSI Fabrication Principles, Wiley India.
3. Weste and Eshraghian: Principles of CMOS VLSI design, Addison-Wesley
4. Weste, Harris and Banerjee: CMOS VLSI Design, Pearson-Education.
5. Pucknell and Eshraghian: Basic VLSI Design, PHI Learning.
6. Botkar: Integrated Circuits, Khanna Publishers.
7. Sze: VLSI Technology, TMH.

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Electronics & Communication Engineering, VII-Semester

Departmental Elective EC- 702 (A) MICROWAVE ENGINEERING

Prerequisite:- Electromagnetic fields , Antenna and wave propagation.

Course Outcome:-

Students should be able to :

- 1. Identify of various types of Microwave electronic components and systems.**
- 2. Understand different modes of operation of various RF and Microwave circuits.**
- 3. Design and analyze of high frequency circuits and systems.**
- 4. Solving complex RF & Microwave communication network design problems S**

SYLLABUS

- Unit 1.** Features and applications of microwaves, Wave propagation in striplines and microstrip lines, Slot lines, Limitations of conventional vacuum tubes, Microwave tubes like Two cavity klystron and Reflex klystron, Magnetron, TWT, Backward wave oscillator etc.
- Unit 2.** Solid state microwave sources, transferred electron devices, Tunnel diode Gunn diode and oscillators, IMPATT diode, TRAPATT diode, Pin diode, Varactor diode, Schottky diode, Parametric amplifiers, Crystal diode, Frequency multipliers, Microwave BJT & FET,
- Unit 3.** Scattering matrix, S-parameters & its applications in Network analysis, Matching Network, Detector diodes, detector mounts, detector output indicator, slotted line, measurement of power, impedance & S-parameter, measurement of frequency & VSWR.
- Unit 4.** Impedance transformer, Microwave filters, Power dividers and directional couplers, E-plane Tee, H-plane tee, Matched hybrid Tee., Wave propagation in ferrite medium, Isolators, Circulators, YIG resonators, Simulation Techniques for design of **Microwave** Components.
- Unit 5.** Analysis and design of Dielectric resonators; Design of RF and microwave low noise and power amplifiers & oscillators using S-parameter techniques, Mixer and converter design, diode phase shifters, attenuators, Design of hybrid and monolithic, microwave and millimeter wave integrated circuits.

Text Books Recommended :

1. Liao S., Microwave Devices & Circuits”, 2nd ed. 2001,PHI.
2. Gupta K.C., Microwave Engg., 3rd ed. 2004,Wiley Easter Pub.
3. Watson, Solid State Microwave Devices, 5th ed. 2008,Wiley.
4. David M. Pozar, Microwave Engineering, 3rd edition, 2011 Willey India.

Reference Books Recommended :

1. Gandhi, Microwave Engineering & Application, 2nd ed. 2005,McMillan Int. Ed.
2. Reich, Microwave Principles, 5th ed. 2009,CBS Publ.
3. Collin, Foundations for microwave engineering, 4th ed. 2001, Wiley Publ.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Departmental Elective EC- 702 (B) INFORMATION THEORY AND CODING

Course Objective: The course aims to introduce information theory, fundamentals of error control coding techniques and their applications, importance of various communication channels, utilization of codes for error detection and correction as well as for practical applications.

Prerequisite: Digital communication and its applications, Probability theory

Course Description: This course will first introduce the basic concepts of information theory, leading to the different coding theorems and then various channel capacity theorem. Afterwards, the course will consider error control coding techniques and various codes for applications.

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

1. Acquire the knowledge in measurement of information and errors.
2. Know the application of coding theorem for efficient utilization of communication resources.
3. Understand the utilization of various communication channels for communication system.
4. Design the block and cyclic codes for error correction and detection in communication systems
5. Know the significance of source and channel codes in various applications.

SYLLABUS

UNIT1 Information Theory: Introduction to uncertainty, entropy and its properties, entropy of binary memoryless source and its extension to discrete memory-less source, Measure of information, Information content of message, Average Information content of symbols. Self information, Mutual information and its properties,

UNIT 2 Coding theorem: Source coding theorem, prefix coding, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman coding, Extended Huffman coding, Arithmetic Coding, Lempel-Ziv Coding, Run Length Encoding.

UNIT 3 Information Channels: Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Discrete memory less channels, Binary symmetric channel and its channel capacity, channel coding theorem, and its application to Binary Erasure Channel, Shannon's theorem on channel capacity, capacity of channel of infinite bandwidth, Continuous Channels.

UNIT 4 Error Control Coding: Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Probability of undetected error for linear block code in BSC, hamming Codes and their applications,

Cyclic Codes: Cyclic codes and its basic properties, Encoding using an (n-k) Bit Shift register, Generator & parity check matrix of cyclic codes, encoding & decoding circuits, syndrome computation, error detection and correction,

UNIT 5 Introduction to BCH codes, its encoding & decoding, error location & correction. Convolution Codes: Introduction to convolution codes, its construction, Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, Viterbi algorithm: Introduction of theorem for maximum likelihood decoding.

Reference Books:

1. Digital Communication - by Haykins Simon Wiley Publ.
2. Error control Coding: Theory and Application, - by Shu Lin and Costello, PHI
3. Digital Communication - by Sklar, Pearson Education
4. Error Correcting Codes - by Peterson W., MIT Press
5. Digital Communication - by Proakis, TMH
6. Information Theory, Coding and Cryptography – By Ranjan Bose, TMH
7. Communication Systems – By Singh and Sapre, TMH

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Electronics & Communication Engineering, VII-Semester

Departmental Elective EC- 702 (C) Nano Electronics

Unit-I: Overview of semiconductor physics. Nanoscale band structure and Electron transport, Quantum confinement in semiconductor nanostructures: quantum wells, quantum wires, quantum dots, super-lattices, band offsets, and electronic density of states, heavily doped semiconductors and low dimensional quantum devices.

Unit-II: Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, overlay-accuracies, Mask-Error enhancement factor (MEEF), Positive and negative photoresists, Electron Lithography, Projection Printing, Direct writing, Electron resists.

Unit-III: Tunnel junction and applications of tunneling, Tunneling Through a Potential Barrier, Metal—Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Coulomb blockade in nanocapacitor, Tunnel Junctions, Tunnel Junction Excited by a Current Source.

Unit-IV: Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode. Nanoscale MOSFET, Finfets, charge and energy quantization in Single electron devices.

Unit-V: Scaling of physical systems – Geometric scaling & Electrical system scaling, Introduction to MEMS and NEMS, working principles, as micro sensors (acoustic wave sensor, biomedical and biosensor, chemical sensor, optical sensor, capacitive sensor, pressure sensor and thermal sensor), micro actuation (thermal actuation, piezoelectric actuation).

Text Book:

1. Nano Technology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springe.
2. Fundamentals of Nanoelectronics, George W. Hanson, 1/e Pearson Education.
3. Nano: The Essentials – Understanding Nano Science and Nanotechnology by T. Pradeep; Tata Mc.Graw Hill.
4. Nanotubes and nanowires by C.N.R. Rao and A. Govindaraj, RSC Publishing
5. Quantum-Based Electronic Devices and Systems by M. Dutta and M.A. Stroscio, World Scientific.

Suggested Reference Books:

1. Stephen D. Sentaria, Microsystem Design, Kluwer Academic Press
2. Marc Madou, Fundamentals of microfabrication & Nanofabrication.

3. T. Fukada&W.Mens, Micro Mechanical system Principle & Technology, Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, Micro sensors MEMS & Smart Devices, 2001.
5. James R Sheats and Bruce w.Smith, "Microlithography Science and Technology", Marcel Dekker Inc., New York, 1998.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Open Elective EC- 703 (A) Cellular Mobile Communication

Course Outcomes

1. Understand various communication standards and multiple accesses
2. Cellular concepts and basics and design
3. Frequency allocation, Reuse, and antennae for mobile communication
4. Various interferences and reduction techniques
5. Various cellular generation, standards and trends

Unit-I

Introduction to cellular mobile system

A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning of cellular system

Elements of cellular radio system design

General description of problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I in an omni-directional antenna system, hand off mechanism, cell splitting, components of cellular systems.

Unit-II

Cell coverage for signal and traffic

General introduction, mobile point-to-point model, propagation over water or flat open area, foliage loss, propagation in near- in distance, long distance propagation, path loss from point-to-point prediction model, cell site antenna heights and signal coverage cells, mobile-to-mobile propagation.

Cell site antennas and mobile antennas

Equivalent circuits of antennas, gain and pattern relationship, sum and difference patterns, antennas at cell site, unique situations of cell site antennas, mobile antennas.

Unit-III

Cochannel interference reduction

Cochannel interference, real time cochannel interference measurement at mobile radio transceivers, design of antenna systems - omni directional and directional, lowering the antenna height, reduction of cochannel interference, umbrella- pattern effect, diversity receiver, designing a system to serve a predefined area that experiences cochannel interference.

Types of Noncochannel interference

Adjacent channel interference, near-end-far-end interference, effect on near-end mobile units, cross-talk, effects of coverage and interference by applying power decrease, antenna height decrease, beam tilting, effects of cell site components, interference between systems, UHF TV interference, long distance interference.

Unit-IV

Frequency management and Channel Assignment

Frequency management, frequency spectrum utilization, setup channels, channel assignment, fixed channel assignment, non-fixed channel assignment algorithms, additional spectrum, traffic and channel assignment, perception of call blocking from the subscribers

Handoffs and dropped calls

Value of implementing handoffs, initiation of handoff, delaying a handoff, forced handoff, queuing of handoff, power- difference handoff, mobile assisted handoff and soft handoff, cell-site handoff and intersystem handoff, dropped call rate formula.

Unit-V

Digital Cellular Systems

GSM- architecture, layer modeling, transmission, GSM channels and channel modes, multiple access scheme. CDMA- terms of CDMA systems, output power limits and control, modulation characteristics, call processing, hand off procedures. Miscellaneous mobile systems- TDD systems, cordless phone, PDC, PCN, PCS, non cellular systems.

References:

1. Lee: Cellular and Mobile Telecommunication- Analog & digital systems, TMH.
2. Rappaport: Wireless Communications- principles and practice, Pears
3. Lee: Mobile communications design fundamentals, Wiley India.
4. Faher Kamilo: Wireless Digital Communication, PHI Learning.
5. Raj Kamal: Mobile Computing, Oxford University Press.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Open Elective EC- 703 (B) Internet of Things (IoT)

Course Objectives (CEO):

The course provides basic knowledge of how to connect various devices through Internet and control them remotely. It will provide methods for different types of networking and data storage. The course aims at providing communication overview and protocols for safe and secure data access and transfer and maintain confidentiality and integrity.

Unit 1: Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.

Unit 2: Machine-to-machine (M2M), SDN (software defined networking) and NFV (network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

Unit 3: Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, MQTT, CoAP, SOAP, REST, HTTP Restful and Web Sockets.
Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

Unit 4: Sensor Technology, Participatory Sensing, Industrial IOT and Automotive IOT, Actuator, Sensor data Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Network Technology.

Unit 5: IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view. IOT Privacy and security solutions, Raspberry Pi & Arduino devices. IOT Case studies: smart city streetlights control & monitoring.

Reference Book:

1. Rajkamal, "Internet of Things", Tata McGraw Hill publication
2. Vijay Madiseti and Arshdeep Bahga, "Internet of things (A-Hand-on-Approach)" 1st Edition, Universal Press
3. Charles Bell "MySQL for the Internet of things", Apress publications.
4. Francis d'acosta "Rethinking the Internet of things: A scalable Approach to connecting everything", 1st edition, Apress publications.
5. Hakima Chaouchi "The Internet of Things: Connecting Objects", Wiley publication.
6. Donald Norris "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

Course Outcomes (COs): After completion of the course the students should be able to

1. Understand in depth about Internet of things.
2. Establish secure communication for his network for his devices connected in IOT.
3. Store his data securely on cloud and access it when required
4. Design web based application using various internet protocols and services
5. Use sensor technology and RFID and wireless networking for maintaining privacy and security concern in smart city and housing environmental considerations.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VII-Semester

Open Elective EC- 703 (C) Probability Theory and Stochastic processing

Course objective

1. Understand the random experiments, sample space and event probabilities
2. Study the random variables, density and distribution functions, moments and transformation of random variables.
3. Understand the concept of random process and sample functions (signals)
4. Explore the temporal and spectral characteristics of random processes.

Course Outcomes

1. Simple probabilities using an appropriate sample space.
2. Simple probabilities and expectations from probability density functions (pdfs)
3. Likelihood ratio tests from pdfs for statistical engineering problems.
4. Least -square & maximum likelihood estimators for engineering problems.
5. Mean and covariance functions for simple random processes.

UNIT-I:

Probability and Random Variable

Probability: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables

UNIT -II:

Distribution & Density Functions and Operation on One Random Variable – Expectations Distribution; Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties. Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT-III:

Multiple Random Variables and Operations

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV:

Stochastic Processes – Temporal Characteristics: The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, Nth Order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V:

Stochastic Processes – Spectral Characteristics: Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4Ed., 2001, TMH.
2. Probability and Random Processes – Scott Miller, Donald Childers, 2 Ed, Elsevier, 2012.

REFERENCE BOOKS:

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, 4 Ed., TMH.
2. Theory of Probability and Stochastic Processes- Pradip Kumar Gosh, University Press
3. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, 3 Ed., PE
4. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MC Gillem, 3 Ed., 1999, Oxford.
5. Statistical Theory of Communication - S.P. Eugene Xavier, 1997, New Age Publications.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering VII-Semester

EC- 705 IOT LAB

List of Experiments

LAB INDEX Design, Developed and implement following using Arduino, Raspberry Pi compiler and Python language in Linux/Windows environment.

1. Study and Install IDE of Arduino and different types of Arduino.
2. Write program using Arduino IDE for Blink LED.
3. Write Program for RGB LED using Arduino.
4. Study the Temperature sensor and Write Program for monitor temperature using Arduino.
5. Study and Implement RFID, NFC using Arduino.
6. Study and Configure Raspberry Pi.
7. WAP for LED blink using Raspberry Pi.
8. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
9. Study and implement MQTT protocol using Arduino.
10. Study and implement CoAP protocol using Arduino.

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Electronics & Communication Engineering, VIII-Semester

EC801- Optical Fibre Communication

PREREQUISITE:-Engineering Physics, Communication Engineering

COURSE OUTCOME:-

Students should be able to:

1. Understand Optical Fiber Communication System and its parameters.
2. Analyze transmission characteristics of optical fiber
3. Understand the construction and operation of various optical sources and detectors.
4. Performance analysis of optical receivers and study of fiber joints
5. Brief introduction of optical fiber networks and amplifiers

Unit 1. Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal analysis of fiber. Optical fibres : Structure & wave guiding fundamentals, basic optical laws.

Unit 2. Signal degradation in Optical Fibre : Signal degradation on optical fiber due to dispersion and attenuation, intermodal and intramodal dispersion, Fabrication of fibers and measurement techniques like OTDR

Unit 3. Optical sources and detectors: LEDs, LASER diodes, Basic concepts of optical Sources various laser and LED structures, Optical detectors: basic principle of photo detection, PIN and avalanche photo diode, phototransistor, photo detector noise, detector response time.

Unit 4. Optical transceivers; Direct detection and coherent receivers, noise in detection process, digital receiver performance calculation, BER, System design, power budgeting, rise time budgeting; fibre joints, and splicing techniques, Optical fibre connectors.

Unit 5. Optical networks and amplifiers- Optical networks : Topologies, networks SONET and SDH. Optical amplifiers - EDFA, Raman amplifier, and WDM systems Passive Optical Networks.

TEXT BOOKS RECOMMENDED:-

1. Senior J.M., Optical Fibre Communications: Principles & Practice, 2nd ed. 2001,PHI.
2. Agrawal Govind P., Fibre Optic Communication Systems, 5th ed. 2001, John Wiley & Sons, studentsed.
3. Black Uyles, Optical Networks and 3rd Genration Transport Systems, 3rd ed. 1998,Pearson.

REFERENCE BOOKS RECOMMENDED:-

1. Keiser G, Optical Fibre Communication, 5th ed. 2006, McGrawHill.
2. Mynbanv and Scheiner, Fibre Optic Communication Technology, 2n^d ed 2010, PearsonEdu.
3. Djfar K Mynbaev &Scheiner, Fibre Optic Communication Technology, 5th ed. 2005,Pearson

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (A) AI & Signal Processing

Course Objective:

To impart knowledge about Artificial Intelligence and to give understanding of the main abstractions and reasoning for intelligent systems and signal processing.

Course Outcomes:

1. Ability to develop a basic understanding of AI building blocks presented in intelligent agents.
2. Ability to choose an appropriate problem-solving method and knowledge representation technique.
3. Ability to analyze the strength and weaknesses of AI approaches to knowledge-intensive problem-solving.
4. Understand real time applications of Fourier transform.
5. Describe discrete time systems in terms of difference equations.

UNIT-I

Introduction of AI

What is AI? Foundations of AI, History of AI, Agents and environments, The nature of the Environment, Problem solving Agents, Problem Formulation, Search Strategies

UNIT-II

Knowledge and Reasoning

Knowledge-based Agents, Representation, Reasoning and Logic, Propositional logic, First-order logic, Using First-order logic, Inference in First-order logic, forward and Backward Chaining

UNIT-III

Learning

Learning from observations, Forms of Learning, Inductive Learning, Learning decision trees, why learning works, Learning in Neural and Belief networks.

Unit IV

Orthogonal transforms

DFT, DCT and Haar; Properties of DFT; Computation of DFT: FFT and structures, Decimation in time, Decimation in frequency; Linear convolution using DFT; Digital filter structures: Basic FIR/IIR filter structures, FIR/IIR Cascaded lattice structures, Parallel allpass realization of IIR transfer functions.

Unit V

Multirate signal processing

Basic structures for sampling rate conversion, Decimators and Interpolators; Multistage design of interpolators and decimators; Polyphase decomposition and FIR structures; Computationally efficient sampling rate converters, Lagrange interpolation, Spline interpolation; Quadrature mirror filter banks; Applications in subband coding;

References:

1. Stuart Russell, Peter Norvig: "Artificial Intelligence: A Modern Approach", 2nd Edition, Pearson Education, 2007
2. Artificial Neural Networks B. Yagna Narayana, PHI
3. Artificial Intelligence , 2nd Edition, E.Rich and K.Knight (TMH).
4. Artificial Intelligence and Expert Systems – Patterson PHI.
- 5.. S K Mitra: "Digital Signal Processing: A Computer-Based Approach" (McGraw Hill)
6. E C Ifeachor and B W Jervis "Digital Signal Processing A Practical Approach" (Pearson)
- 7.R. Chassaing and D. Reay, Digital signal processing and applications with TMS320C6713 and TMS320C6416, Wiley, 2008.
- 8.J. G. Proakis and D. G. Manolakis, Digital Signal Processing:

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (B) Wireless Communication

Course Objective:

Understand the functioning of wireless communication system and evolution of different wireless communication systems and standards, comparison of recent technologies used for wireless communication, explanation of architecture, functioning, protocols, capabilities and application of various wireless communication networks.

Course Outcomes:

1. Explain and compare the various cellular systems and its components
2. Apply and analyze mobile communication concepts
3. Describe network and system architecture, channel concept and system Operations in TDMA and CDMA systems
4. Apply and analyze radio propagation models, coding and modulation Techniques in Wireless Communication systems.
5. Analyze improved data services in cellular communication

Unit-I

Introduction

Applications and requirements of wireless services: history, types of services, requirements for the services, economic and social aspects.

Technical challenges in wireless communications: multipath propagation, spectrum limitations, limited energy, user mobility, noise and interference-limited systems.

Propagation mechanism: free space loss, reflection and transmission, diffraction, scattering by rough surfaces, wave guiding.

Unit-II

Wireless Propagation channels

Statistical description of the wireless channel: time invariant and variant two path models, small-scale fading with and without a dominant component, Doppler spectra, temporal dependence of fading, large scale fading.

Wideband and directional channel characteristics: causes of delay dispersion, system theoretic description of wireless channels, WSSUS model, condensed parameters, ultra wideband channels, directional description.

Unit-III

Channel models: Narrowband, wideband and directional models, deterministic channel-modeling methods.

Channel sounding: Introduction, time domain measurements, frequency domain analysis, modified measurement methods, directionally resolved measurements.

Antennas: Introduction, antennas for mobile stations, antennas for base stations.

Unit-IV

Transceivers and signal processing: Structure of a wireless communication link: transceiver block structure, simplified models. Modulation formats, demodulator structure, error probability in AWGN channels, error probability in flat-fading channels, error probability in delay and frequency-dispersive fading channels.

Unit V

Diversity: Introduction, microdiversity, macrodiversity and simulcast, combination of signals, error probability in fading channels with diversity reception, transmit diversity.

Equalizers: Introduction, linear equalizers, decision feedback equalizers, maximum likelihood sequence estimation (Viterbi detector), comparison of equalizer structures, fractional spaced equalizers, blind equalizers.

References:

1. Molisch: Wireless Communications, Wiley India.
2. Taub and Schilling: Principles of Communication Systems, TMH.
3. Haykin: Modern Wireless Communication, Pearson Education.
4. Upena Dalal: Wireless Communication, Oxford University Press.
5. Rappaport: Wireless Communication, Pearson Education.
6. Price: Wireless Communication and Networks, TMH.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Departmental Elective EC 802 (C) 5G Technology

Course Outcomes

1. Describe 5G Technology advances and their benefits
2. Distinguish the key RF, PHY, MAC and air interface changes required to support 5G
3. Demonstrate Device to device communication and millimeter wave communication
4. Implementation options for 5G
5. Modeling of MIMO system

Unit I : Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro) , An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

Unit II : The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems.

Unit III : Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

Unit IV : Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

Unit V : Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).

Textbooks:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

References

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (A) Wireless Network

PREREQUISITES: - Communication systems, Digital Communication, Telecommunication switching system, Computer Networks, Mobile and Wireless Communication

COURSE OUTCOMES:-

1. Review the concepts of wireless and mobile communication
2. Understand LTE and OFDM technologies for mobile telephony
3. Understand the basic concepts of wireless sensor network
4. Understand mobile networking and compare transport layer protocols for mobile and traditional networks
5. Understand the technology and standards of IoT, ZigBee

Unit 1 Review of Cellular Networks

Mobile telephony, GSM, CDMA/CD, Universal Mobile Telecommunication System (UMTS). Advancement and migrations. WLAN- PHY Layer and MAC Layer-IEEE 802.11 (a, b, g, ac), HIPERLAN, Wireless ATM, WiMAX- PHY Layer and MAC Layer-IEEE 802.16 (fixed and mobile).

Unit 2 LTE systems

Introduction to 3GPP, LTE & LTE-A standards, LTE uplink/downlink, E-UTRAN architecture-Mobility and resource management, services, UTRAN- Architecture , HSDPA, HSUPA, OFDM, OFDMA, SISO system, MIMO system, OFDM-MIMO.

Unit 3 Wireless Sensor Networks

Introduction to wireless sensor network (WSN), WSN-Architecture, Coverage and placement, Topology management in WSN, Applications, Mobile WSN, Technologies for sensor nodes & networks, operating environment, Under water WSN, Security of WSN, MAC, Routing and Transport protocols for WSN

Unit 4 Wireless routing Protocols

Medium access problems in wireless networks, Traditional routing, Mobile network layer-Mobile IP, Introduction to IPv4 and IPv6, Data forwarding procedure in Mobile IP (IPv4 and IPv6), Mobility management, Protocol trade-offs, Congestion window management, Mobile transport layer- Traditional TCP, mobile TCP, Indirect TCP, Reno, New-Reno, Tahoe, Vegas. UDP.

Unit 5 Internet of things (IoT) and GPS systems

IoT architecture, Main design principles and needed capabilities, IoT Devices and gateways, Case studies: Sensor body area network, Control of a smart home, Smart vehicles, Smart manufacturing and smart factory. Emerging IoT standards, IoT-protocols, IoT Local and wide area networking, IEEE 802.15 WPAN, Bluetooth-pico net, scatter net, Protocol stack, Interface between 802.11 and Bluetooth. Geolocation service techniques and standards. Introduction to GPS-aided GEO augmented navigation (GAGAN), E.911, ZigBee, UWB and RFID.

Text Books:

1. Kaveh Pahlavan, Prashant Krishnamoorthy – *Principle of wireless networks- A unitedapproach*- Pearson Education,2002
2. Vijay K. Garg – *Wireless communication and networking* – Morgan-Kaufmann series in networking- Elsevierpublication
3. Feng Zhao and Leonidas Guibas – *Wireless Sensor Networks, An informationprocessing approach* - Morgan Kaufmannpublication

Reference Books:

1. Kazem Sohraby, Daniel Minoli and TaiebZnati- *Wireless Sensor Networks: Technology, Protocols and Applications* -Wileypublication
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos,David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press,2014.
3. Ramji Prasad "*OFDM for wirelescommunication*"
4. Steve Rackley "*Wireless NetworkingTechnology*."

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (B) Digital Image Processing

Course Objectives

To study the image fundamentals and mathematical transforms necessary for image processing, image enhancement techniques, image restoration procedures, and image compression.

Course Outcomes:

1. Understand the basic elements of digital image processing
2. Develop and analyse the algorithm for discrete fourier transformations.
3. Understand the concept of Image enhancement by analyzing different filtering techniques.
4. Applying different models and techniques to understand the concept of image restoration
5. Analyze and implement different image encoding methods

Unit-I

Digital Image Processing (DIP)

Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system.

Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

Unit-II

Image Transforms

Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT.

Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

Unit-III

Image Enhancement

Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method.

Frequency domain methods: basics of filtering in frequency domain, image smoothing filters

(Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

Unit-IV

Image Restoration

Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

Unit-V

Image Compression

Fundamentals of data compression: basic compression methods: Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding.

Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

References:

1. Gonzalez and Woods: Digital Image Processing, Pearson Education.
2. Anil Jain: Fundamentals of Digital Image Processing, PHI Learning.
3. Annadurai: Fundamentals of Digital Image Processing, Pearson Education.
4. Sonka, Hlavac and Boyle: Digital Image Processing and Computer Vision, Cengage Learning.
5. Chanda and Majumder: Digital Image Processing and Analysis, PHI Learning.
6. Jayaraman, Esakkirajan and Veerakumar: Digital Image Processing, TMH.
7. William K. Pratt, Digital Image Processing, Wiley India.

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New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering, VIII-Semester

Open Elective EC 803 (C) Speech Processing

Course Objectives

To study speech production and related parameters of speech and to understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes:

1. Model speech production system and describe the fundamentals of speech.
2. Extract and compare different speech parameters.
3. Choose an appropriate statistical speech model for a given application.
4. Design a speech recognition system.
5. Use different speech synthesis techniques.

Unit-I

Basic Concepts of Speech Processing

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

Unit-II

Speech Analysis

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

Unit-III

Speech Modeling

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

Unit-IV

Speech Recognition

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – ngrams, context dependent sub-word units; Applications and present status.

Unit-V

Speech Synthesis

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

References:

2. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.

3. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education.

4. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing.

5. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.

6. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.

7. Ben Gold and Nelson Morgan, “Speech and audio signal processing”, processing and perception of speech and music, Wiley- India Edition, 2006 Edition.

8. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press.

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Electronics & Communication Engineering VIII-Semester

EC 804- Advanced Communication Engg. Lab

1. Amplitude Shift Keying Modulation and Demodulation
2. Frequency shift keying Modulation and Demodulation
3. BPSK Generation and Detection
4. DPSK Generation and detection.
5. QPSK Generation and detection
6. Time Division Multiplexing of 2 Bandlimited Signals
7. Analog and Digital Communication Link Using Optical Fiber
8. Study of Manchester Coding & Decoding
9. Measurement of frequency ,guided wavelength,power,VSWR and attenuation in a microwave test bench
10. Study Of Dipole Antenna Radiation Pattern (Simple Dipole and Folded Dipole antenna)
11. To find the Gain and Directivity of Yagi-Uda Antenna, Dipole antenna and Patch antenna
12. Determination of coupling and isolation characteristics of a stripline directional coupler.
13. Power Division and Isolation characteristics of a microstrip 3dB power divider