List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Electronics and Communication Engineering*

Programme Name : *B.Tech.*

Academic Year : 2020-21

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	MA201TBS01	Mathematics-I
02.	PH201TBS02	Physics
03.	EC201TES01	Basic Electrical & Electronics Engineering
04.	IT201TES02	Introduction to Information Technologies
05.	EN201THS01	English Communication
06.	PH201PBS01	Physics Lab
07.	ME201PES01	Engineering Graphics
08.	ME201PES02	Workshop Technology & Practices
09.	EC201PES03	Basic Electrical Engineering Lab
10.	MA202TBS03	Mathematics-II
11	CY202TBS04	Chemistry
12	CE202TES03	Engineering Mechanics
13	CS202TES04	Computer Programming
14	CM202TES05	Basic Civil & Mechanical Engineering
15	CY202PBS02	Chemistry Lab
16	CE202PES04	Engineering Mechanics Lab
17	CS202PES05	Computer Programming Lab
18	EC03TPC01	Electronic Devices
19	EC03TPC02	Digital System Design
20	EC03TPC03	Signals and Systems
21	EC03TPC04	Network Theory
22	EC03TBS05	Mathematics-III
23	EC03THS02	Engineering Economics
24	EC03PPC01	Electronics Devices Lab
25	EC03PPC02	Digital System Design Lab
26	EC04TPC05	Analog and Digital Communication

27	EC04TPC06	Analog Circuits
28	EC04TPC07	Microcontrollers
29	EC04TBS06	Numerical Methods
30	EC04TES05	Electronics Measurement & Instrumentation
31	EC04THS03	Effective Technical Communication
32	EC04PPC03	Analog and Digital Communication Lab
33	EC04PPC04	Analog Circuits Lab
34	EC04PPC05	Microcontrollers Lab
35	EC05TPC08	Electromagnetic Waves
36	EC05TPC09	Computer Network
37	EC05TPC10	LIC and its Application
38	EC05TPC11	Control Systems
39	EC05TPE01	Information Theory & Coding
40	EC05TPE02	CMOS Design
41	EC05TPE03	Introduction to MEMS
42	EC05TPE04	Computer Architecture
43	EC05TOE01	Data Structure and Algorithms
44	EC05TOE02	Operating Systems
45	EC05PPC06	Electromagnetic Waves Lab
46	EC05PPC07	Computer Networks Lab
47	EC05PPC08	LIC and its Application Lab
48	EC06TPC12	Digital Signal Processing
49	EC06TPC13	Probability Theory and Stochastic Processes
50	EC06TPE05	Antenna & Wave Propagation
51	EC06TPE06	Power Electronics
52	EC06TPE07	High Speed Devices & Circuits
53	EC06TPE08	Nanoelectronics
54	EC06TOE03	Cryptography & network Security
55	EC06TOE04	Artificial Intelligence
56	EC06TBS07	Life Science
57	EC06PPC09	Digital Signal Processing Lab
58	EC06PPC10	Electronic Measurement Lab
59	EC06PPC11	Mini Project/Electronic Design Wokshop
60	EC5TPC07	Lic & Its Application
61	EC5TPC08	Communication System- II

62	EC5TPC09	Electromagnetic Field Theory
63	EC5TPE01	Microprocessor & Its Application
64	EC5TPE02	Data Structure & Operating System
65	EC5TOE11	Computer Architecture
66	EC5TOE12	OOP in C++
67	EC5TOE13	Introduction to Information Security
68	EC5TOE14	Project Management
69	EC5TOE15	Rural Technology and Community Development
70	EC5PPC07	Lic & Its Application Lab
71	EC5PPE01	Microprocessor & Its Application Lab
72	EC5PPC08	Communication System -II Lab
73	EC6TPC10	Digital Signal Processing
74	EC6TPC11	Antenna & wave propagation
75	EC6TPE03	Data Communication & Computer Networking
76	EC6TPE04	Fundamental of VLSI Design
77	EC6T0E21	UNIX, Operating System
78	EC6T0E22	Probability & Stochastic Process
79	EC6TOE23	Advanced Instrumentation
80	EC6T0E24	Knowledge management
81	EC6T0E25	Engineering System Design Optimization
82	EC6PPE02	VHDL Lab
83	EC6PPC06	Digital Signal Processing Lab
84	EC6PSP01	Seminar
85	EC7TPC12	Microwave Engineering
86	EC7TPC13	Wireless Mobile Communication
87	EC7TPE05	Advance Hardware Design
88	EC7TPE06	Power Electronics
89	EC7TOE31	Wireless Sensor Network
90	EC7TOE32	Information theory and coding
91	EC7TOE33	Nanotechnology
92	EC7TOE34	Optical instrumentation and measurement
93	EC7TOE35	Neural Network and Fuzzy Logic
94	EC7TPPC12	Microwave Engineering Lab
95	EC7TPPE05	Comprehensive Viva
96	EC7PSP02	Project-I

97	EC8TPC14	Radar and Satellite Engineering
98	EC8TPC15	Optical Fiber Communication
99	EC8TPE07	VLSI Fabrication Methodology
100	EC8TOE41	Basic building block of Microwave Engineering
101	EC8TOE42	Principle of Management
102	EC8TOE43	Mobile Computing
103	EC8TOE44	Embedded System
104	EC8TOE45	Advanced Power Electronics
105	EC8TPPC15	Optical Fiber Communication Lab
106	EC8TPPC16	Advanced RF and Microwave Design lab
107	EC8TPSP03	Project-II
108	EC8TPSP04	Comprehensive Viva
109	ET7100	Research Methodology in engineering
110	EC102	Vaccume Technology
111	EC103	Finite Element Method
112	EC104	Sensors Measurement Science & Technology
113	EC105	Artificial Intelligence
114	EC106	Optimization Techniques
115	EC107	Antenna for Modern Wireless Communication
116	EC108	Wireless and Computer Network

विभागाध्यक्ष (इले. एव संचार अभियांत्रिकी)
H.O.D. (Elect. & Comm. Engineering)
प्रौद्योगिकी संस्थान
Institute of Technology
गु. घा. वि., बिलासपुर (छ.ग.)
G. G. V. Bilaspur (C.G.)

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPC11	3	1	0	4 hours	30	70	4

CONTROL SYSTEMS

Course Objectives:

The students will be able to learn:

- The type of System, dynamics of physical systems, classification of control system, analysis and design objective.
- How to represent system by transfer function and block diagram reduction method and Mason's gain formula.
- Time response analysis and demonstrate their knowledge to frequency response.
- Stability analysis of system using Root locus, bode plot, polar plot, and Nyquist plot.

Unit I: Introduction to control problem- Industrial Control examples. Transfer function. Block diagram and signal flow graph analysis. Open & Closed-loop systems, Control hardware and their models: potentiometers, synchros, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators.

Unit II: Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain, proportional, integral and derivative systems. Feed forward and multi-loop control configurations,

Unit III: Feedback control systems- Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. stability concept, relative stability, Routh stability criterion. Root locus method of design. Lead and lag compensation.

Unit IV: Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation.

Unit V : State variable Analysis- Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept controllability & observability. Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, tracking problem. Nonlinear system – Basic concept & analysis.

Text/Reference Books:

1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
3. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991.
4. Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPE01	3	0	0	3 hours	30	70	3

INFORMATION THEORY & CODING

Course Objectives:

- Design the channel performance using Information theory.
- Comprehend various error control code properties.
- Apply linear block codes for error detection and correction.
- Apply convolution codes for performance analysis & cyclic codes for error detection and correction.
- Apply Turbo coding and decoding for error detection and correction.

Unit I: Source Coding: Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and entropy, Information Measures for continuous Random Variables, Source Coding Theorem, Huffman coding.

Unit II: Channel Capacity Coding: Channel Models, Channel Capacity, Channel Coding, Information Capacity Theorem, Shannon Limit, Markov sources.

Unit III: Error Control Coding (Channel Coding) Linear Block Codes for Error Correction & Cyclic Codes: Introduction to Error Correcting Codes, Basic Definitions, Matrix Description of Linear Block Codes, Equivalent Codes, Parity Check Matrix, Decoding of a Linear Block Code, Syndrome Decoding, Hamming Codes. **Cyclic Codes:** Polynomials, The Division algorithm for Polynomials, A Method for Generating Cyclic codes, Matrix Description of cyclic codes, Burst Error Correction.

Unit IV: Convolution Codes: Introduction to Convolution Codes, Tree codes and Trellis Codes, Polynomial Description of Convolution Codes (analytical Representation), distance Notions for Convolution Codes, The Generating Function, Matrix Description of Convolution Codes, Viterbi Decoding, Distance Bounds for Convolution Codes.

Unit V: Turbo Codes: Turbo codes, Turbo decoding, Distance properties of turbo codes, Convergence of turbo codes

Text/Reference Books:

1. Simon Haykin, Digital Communications, Wiley India Edition, 2009
2. N. Abramson, Information and Coding, McGraw Hill, 1963.
3. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
4. R.B. Ash, Information Theory, Prentice Hall, 1970.
5. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.
6. Todd K. Moon, "Error Correction Coding", 1st Edition, Wiley-Interscience, 2006.
7. F. J. MacWilliams, N. J. A. Sloane, "The Theory of Error-Correcting Codes", North-Holland, Amsterdam, 1977
8. R. E. Blahut, "Algebraic Codes for Data Transmission", 1st Edition, Cambridge University Press 2003.
9. Cary W. Huffman, Vera Pless, "Fundamentals of Error-Correcting Codes", 1st Edition, Cambridge University Press, 2003.
10. Rolf Johannesson and Kamil Sh. Zigangirov, ``Fundamentals of Convolutional Coding'', IEEE Press, 1999.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPE02	3	0	0	3 hours	30	70	3

CMOS DESIGN

Course Objectives:

- Impart knowledge of MOS transistor theory and CMOS technologies.
- Impart knowledge on architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology. study of VHDL language

Unit I: FUNDAMENTALS OF MOSFETS: Introduction to MOS transistor, basic operation, threshold voltage ,V-I characteristic ,Depletion MOSFET ,trans conductance, PMOS and its V-I characteristic, aspect ratio and its implication, channel length modulation, substrate bias effect, electrical parameters of MOSFETS.

Unit II: CMOS INVERTER: Introduction, ideal inverter, Logic level standards, VTC of inverter, Noise margin, Basic NMOS inverter, CMOS inverter, design technique, inverter switching characteristic, delay times, transient effects, power dissipation, introduction to bi-CMOS inverter

Unit III: STATIC AND DYNAMIC LOGIC CIRCUITS: Introduction, Various Static CMOS logic gate design ,Pseudo-nMOS gates ,pass transistor logic, transmission gates, tristate buffer, dynamic logic, Evaluate logic, Domino CMOS logic, Non ideal effects of dynamic logic circuits

Unit IV: SEQUENTIAL AND COMBINATIONAL CIRCUITS: Types of regenerative circuits, bi-stability principle, basics S-R flip flop, JK flip-flop, Master slave Flip Flop, D latch, Static Vs Dynamic latch ,memory system, types of semiconductor memory, Dynamic RAM, Static RAM.

Unit V: INTRODUCTION TO VHDL: Introduction and use of VHDL, Entity and Architecture Declaration, Types of Models of Architecture, Data objects, Data types, Operators ,concurrent and sequential statements, process statements, case ,if, when statements ,Design of sequential and combinational circuits.

Text/References books:

1. Douglas A. Pucknell & Kamran Eshraghian "Basic VLSI Design", PHI 3rd Edition.
2. Neil H.E. Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design-A Circuits and Systems Perspective", Pearson Education 3rd Edition.
3. J Bhaskar, "A VHDL Primer", Pearson Publication.
4. Brow and Varsenic "Fundamentals of VLSI Design Techniques with VHDL" MGH Publication.
5. Angsuman Sarkar and Swapandip De, "VLSI design and EDA tools", SCITECH Publication.

Course outcomes:

At the end of this course, students will demonstrate the ability:

- To introduce the concept of VLSI.
- To introduce the concept of MOS fabrication, MOS design and different MOS circuits.
- To introduce the concept of VHDL.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPE03	3	0	0	3 hours	30	70	3

INTRODUCTION TO MEMS

Course Objectives:

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

Unit I: Introduction : Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication – Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

Unit II: Sensors and Actuators-I : Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors – Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph – Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys.

Unit III : Sensors And Actuators-II: Piezoresistive sensors – Piezoresistive sensor materials – Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

Unit IV: Micromachining: Silicon Anisotropic Etching-Anisotrophic Wet Etching-Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE)-Isotropic Wet Etching-Gas Phase Etchants – Case studies –Basic surface micro machining processes-Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process.

Unit V: Polymer and Optical MEMS: Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

Text books:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TPE04	3	0	0	3 hours	30	70	3

COMPUTER ARCHITECTURE

Course Objectives:

- To provide an introduction to concepts in computer architecture.
- Impart knowledge on design aspects, system resources such as memory technology and I/O subsystems needed to achieve increase in performance.
- Acquaint the students with current trends in computing architecture.

Unit I: Processor Basics: CPU Organization, Fundamental and features, Data Representation formats, Fixed and Floating point representation, Instruction Sets, Formats, Types and Programming Considerations.

Unit II: Data path Design: Fixed-Point Arithmetic, Combinational ALU and Sequential ALU, Floating point arithmetic and Advanced topics, Hardware Algorithm – Multiplication, Division.

Unit III: Control Design: Basic Concepts, Hardwired control, Microprogrammed Control, CPU control Unit and Multiplier control Unit, Pipeline Control.

Unit IV: Memory Organization: Memory device characteristics, RAM technology and Serial access memories technology, multilevel memory systems, Address translation and Memory allocation systems, Cache memory.

Unit V: System Organization: Programmed I/O, DMA, Interrupts and IO Processors, Processor-level Parallelism, Multiprocessor and Fault tolerance system.

Text /Reference Books:

1. V. Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, "Computer System Architecture", Edition
5. C.W.Gear, "Computer Organization and Programming", McGraw Hill, N.V. Edition
6. Hayes J.P, "Computer Architecture and Organization", PHI, Second edition
7. Computer Organizations and Design- P. Pal Chaudhari, Prentice-Hall of India

Course Outcomes:

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

- Learn how computers work
- Know basic principles of computer's working
- Analyze the performance of computers
- Know how computers are designed and built
- Understand issues affecting modern processors (caches, pipelines etc.).

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TOE01	3	0	0	3 hours	30	70	3

DATA STRUCTURE & ALGORITHMS

Course Objectives:

- Learn Basic Data Structures such as, Linked Lists, Stacks and Queues, Tree and Graph.
- Learn Algorithm for Solving Problems Like Sorting, Searching, Insertion and Deletion of Data
- Understand the Complexity of Various Algorithms.
- Introduce Various Techniques for Representation of the Data in in Memory.

Unit I: Algorithm Analysis and Complexity, Data Structure- Definition, Types of Data Structures Recursion: Definition, Linear and Binary Recursion, Searching Techniques, Linear Search, Binary Search.

Unit II: Sorting Techniques: Basic Concepts, Sorting Algorithms: Insertion (Insertion Sort), Selection (Heap Sort), Exchange (Bubble Sort, Quick Sort), Distribution (Radix Sort) and Merging (Merge Sort) Algorithms.

Unit III: Stacks and Queues: Stacks: Basic Stack Operations, Representation of a Stack Using Arrays, Stack Applications: Reversing List, Factorial Calculation, Infix to Postfix Transformation, Evaluating Arithmetic Expressions.

Queues: Basic Queue Operations, Representation of a Queue Using Array, Implementation of Queue Operations Using Stack. Circular Queues, Priority Queues. Applications of Queues- Round Robin Algorithm,

Unit IV: Linked Lists: Introduction, Single Linked List, Representation of a Linked List in Memory, Operations on a Single Linked List, Circular Linked List, Double Linked List, Advantages and Disadvantages of Linked List.

Unit V: Trees: Terms Related to Tree, Binary Tree, Binary Tree Traversals, Creation of Binary Tree from In-order, Pre-order and Post-Order Traversals. Threaded Binary Trees. Binary Search Tree, BST Operations: Insertion, Deletion.

Graphs: Basic Concepts, Representations of Graphs: Using Linked List and Adjacency Matrix, Graph Algorithms. Graph Traversals (BFS & DFS), App1ications: Dijkstra's Shortest Path, Minimum Spanning Tree Using Prim's Algorithm, Warshall's Algorithm

Text books:

1. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.
2. G. a. V. Pai, Data Structures and Algorithms-2008, TMH
3. Debasis,Sarnanta- Classic Data Structures- 2/E, PHI,2009

Reference books:

1. E. Horowitz, SartajSahni and Susan anderson, W. H. Freeman -Fundamentals of Data Structures in C
2. Schaum's Series- Introduction of Data Sructure-Prentice Hall of India

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05TOE02	3	0	0	3 hours	30	70	3

OPERATING SYSTEMS

Course Objectives:

- To Understand the Services Provided by Operating System
- To Understand the Working and Organization of Process and its Scheduling and Synchronization.
- To Understand the Concept of Deadlock.
- To Understand Different Approaches of Memory Management Techniques.
- To Understand the Structure and Organization of the File System.

Unit I: Definitions, Components and Types of Operating System, Operating System Services, System Calls, System Programs, Process Concepts, Process State & Process Control Block, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Multiple- Processor Scheduling, Real-Time Scheduling, Threads Introduction

Unit II: The Critical Sections Problem, Semaphores, Classical Problem of Synchronization, Deadlock Characterizations, Method for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock

Unit III: Storage Management Logical Versus Physical Address Space, Swapping, Contiguous Allocating, Paging, Segmentation, Virtual Memory, Demand Paging, Performance of Demand Paging, Page Replacement, Page Replacement Algorithms, Thrashing, Demand Segmentation

Unit IV: Disk Structure, Disk Scheduling, Disk Management, Swap Space Management, Disk Reliability, Stable Storage Implementation, File Concepts, Directory Structure, Protecting, I/O Subsystem Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem

Unit V: Introduction to distributed systems: I/O Subsystem Principles of I/O Hardware: I/O devices, device controllers, direct memory access. Principles of I/O Software: Goals, interrupt handlers, device drivers, device independent I/O Software. User space I/O software, I/O protection. Distributed file systems: Design, Implementation, and trends. Performance Measurement: Important trends affecting performance issues, performance measures, evaluation techniques, bottlenecks and saturation feedback loops. Case study of UNIX, DOS and WINDOWS operating systems.

Text books:

1. Silberschatz, Galvin, Gagne-Operating System Concepts -Wiley Student Edition
2. Milan Milenkovic-Operating System Concepts & Design-TMH Publication
3. Andrew S. Tanenbaum-Modern Operating System-PHI

Reference books:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, IrwinPublishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hallof India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reillyand Associates

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05PPC06	0	0	2	2 Hours	30	20	1

ELECTROMAGNETIC WAVES LAB

Course Objectives:

- To understand the concepts and working principles of the devices used in propagation of Electromagnetic Waves
- Understand principle of radiation and radiation characteristics of an antenna

List of Experiments:

1. Design of Rectangular waveguide
2. Design of Circular Waveguide
3. Design and Analysis of Transmission line
4. Design of Transmission line as a circuit element
5. Analysis and use of smith chart for impedance calculation
6. Analysis and use of smith chart for admittance calculation
7. Field visualization in waveguide
8. Analysis of radiation pattern and various parameter of antenna
9. Design of Monopole Antenna
10. Design of dipole Antenna

Course Outcomes:

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

- Use sections of transmission line sections for realizing circuit elements
- Analyze wave propagation on metallic waveguides in modal form
- Understand principle of radiation and radiation characteristics of an antenna

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05PPC07	0	0	2	2 Hours	30	20	1

COMPUTER NETWORK LAB

Course Objectives:

Student will try to learn:

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

List of Experiments:

1. Study of Local Area Network.
2. Study of Network Devices in Detail.
3. Program to calculate the channel capacity.
4. Program to calculate SINR (signal-to-noise-plus-interference ratio) using the channel capacity theorem.
5. Program to calculate Bandwidth using the channel capacity theorem.
6. Study of Ethernet.
7. Study of pure aloha protocol.
8. Study of slotted protocol.
9. Study of FTP (File transfer Protocol).
10. Study of Token Bus Protocol.
11. Study of Token Ring Protocol.
12. Study of Network Topologies.
13. Study of Selective Repeat protocol.
14. Study of CSMA-CD Protocol

Course Outcomes:

At the end of this course students will demonstrate the ability to:

- Identify and use various networking components
- Understand different transmission media and design cables for establishing a network.
- Implement device sharing on network
- Learn the major software and hardware technologies used on computer networks.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC05PPC08	0	0	2	2 Hours	30	20	1

LIC AND IT'S APPLICATIONS LAB

Course Objectives:

Student will try to learn:

- To design amplifier using transistor.
- To design amplifier using op-amp.
- To design oscillators.
- To design filters.

List of Experiments

1. To design a bistable multivibrator circuit and to draw its output waveform.
2. To design a monostable multivibrator circuit and to draw its output waveform.
3. To design a astable multivibrator circuit and to draw its output waveform.
4. To design an inverting amplifier using opamp (741) and study its frequency response.
5. To design a non-inverting amplifier using opamp (741) and study its frequency response.
6. To design a summing amplifier using opamp (741)
7. To design a differential amplifier using opamp (741) and find its CMRR.
8. To determine SVRR and slew rate of an opamp (741)
9. To design an astable multivirator using 555 timer
10. To design a monostable multivibrator using 555 timer.
11. To design and study a diode clamper circuit.
12. To design and study diode series and shunt clipper.
13. To measure the input impedance of an voltage follower using opamp (741)
14. To design and study comparator circuit using opamp (741)
15. To study the voltage regulation of 78xx and 79xx series of voltage regulators.

Course outcomes:

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

- Design and test amplifiers using transistors and op-amps
- Analyze and test oscillators.
- Implement and design of analog active filters using op-amps.
- Design and test voltage regulated power supply.
- Implement and understand the voltage regulators.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPC12	3	1	0	4 hours	30	70	4

DIGITAL SIGNAL PROCESSING

Course Objectives:

To provide an overview of topics in basic and advanced digital signal processing techniques with applications to speech and image processing.

Unit I: Introduction of discrete time signals, Representation of signals on orthogonal basis, Sampling and reconstruction of signals, Discrete systems attributes, Introduction of Z-Transform, Analysis of LSI systems, Frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT), Convolution, Correlation, Fast Fourier Transform Algorithm, Decimation –in-Time, Decimation –in-Frequency,

Unit II: Realization of Systems: Realization of digital linear system, Structures for realization of discrete time systems, Structures for IIR and FIR systems, **Realization of IIR filter:** Direct form-I, Direct form-II, Signal flow graph, Cascade form, Parallel structure, Lattice structure, Lattice-Ladder structure. **Realization of FIR filter:** Transversal structure, linear phase realization, Lattice structure.

Unit III: Infinite Impulse Response Filter design (IIR): Features of IIR filters, Design stages, Filter design by Approximation of Derivatives, Impulse invariance method, bilinear transformation method, Butterworth and Chebyshev Design Method, Frequency Transformations in Analog and Digital domain.

Unit-IV: Finite Impulse Response (FIR) Filter Design: Linear phase response- Symmetric and Antisymmetric, Design by Window method, Optimal method, Rectangular, Triangular, Hanning, Hamming, Blackman & Kaiser Window, Frequency sampling method, Design of FIR differentiators, Design of Hilbert transformer, Comparison of various design methods.

Unit V: Sampling Theorem and Multi-rate DSP: Introduction, Sampling Rate Conversion by rational factor, Decimation of Sampling rate by an Integer factor, Interpolation of sampling rate by an Integer Factor, Sampling rate alteration or conversion by a rational factor.

Applications of Digital Signal Processing: Introduction, Applications of DSP Digital Sinusoidal Oscillators, Digital Time Control Circuits, Digital Comb Filters. Applications in broader sense: Applications of DSP in Image Processing, Applications of DSP to Radar, Applications of DSP in speech processing.

Text/Reference Books:

1. S. K. Mitra, " Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing" , Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, " Digital Signal Processing: Principles, Algorithms And Applications" , Prentice Hall, 1997.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPC13	3	0	0	3 hours	30	70	3

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Objectives:

The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modelling, climate prediction and computer networks etc

Unit I: Introduction to Probability and random variables: Definitions, scope and history; limitation of classical and relative-frequency-base definitions, Sets, fields, sample space and events; axiomatic definition of probability. Combinatorics: Probability on finite sample spaces. Joint and conditional probabilities, independence, total probability; Bayes' rule and applications. The random variable concept, Distribution function, Density function, The Gaussian random variable, other distribution and density examples, Conditional distribution and density functions.

Unit II: Operation on One Random Variable – Expectation & Multiple Random Variables Expectation, Moments, Functions that give Moments, Transformations of a random variable, Computer generation of one random variable. Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, Statistical independence, Distribution and density of a sum of random variables, Central limit theorem.

Unit III: Random Processes-The random process concept, Stationarity and independence, Correlation functions, Measurement of correlation functions, Gaussian random processes, Poisson random process, Complex random processes

Unit IV: Spectral Characteristics of Random Processes-Power density spectrum and its properties, Relationship between power spectrum and autocorrelation function, Cross-Power density spectrum and its properties, Relationship between cross-power spectrum and cross-correlation function, Some noise definitions and other topics, power spectrum of complex processes.

Unit V: Queueing Theory Introduction markov sequences Queueing Systems, Birth-Death Process The M/M/1 Queueing System The M/M/s Queueing System The M/M/1/K Queueing System The M/M/s/K Queueing System.

Text books:

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

Reference Books:

1. Theory of probability and Stochastic Processes-Pradip Kumar Gosh, UniversityPress
2. Probability and Random Processes with Application to Signal Processing - Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Probability Methods of Signal and System Analysis- George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 1999.

Sub Code	L	T	P	Duration	IA	ESE	Credits
EC06TPE05	3	1	0	4 hours	30	70	4

ANTENNA & WAVE PROPAGATION

Course Objectives:

- To understand the concepts of radiation from loop and wire antenna.
- To understand the basic concept of large gain and broadband antennas.
- To understand the concepts and working principle of currently popular antennas.
- To understand the working of smart antenna and beam forming to fulfill the requirement of latest technologies.

Unit I: 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: Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

Unit III: Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas. Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.

Unit IV: Micro strip Antennas- Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas, Dielectric Resonator Antenna, Antenna Arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes.

Unit-V: Planar arrays, synthesis of antenna arrays, Basic Concepts of Smart Antennas-Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming, Different modes of Radio Wave propagation used in current practice.

Text/Reference Books:

1. J.D. Kraus, "Antennas", McGraw Hill, 1988.
2. C.A. Balanis, "Antenna Theory - Analysis and Design", John Wiley, 1982.
3. R.E. Collin, "Antennas and Radio Wave Propagation", McGraw Hill, 1985.
4. R.C. Johnson and H. Jasik, "Antenna Engineering Handbook", McGraw ill, 1984.
5. I.J. Bahl and P. Bhartia, "Microstrip Antennas", Artech House, 1980.
6. R.K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill, 2005
7. R.E. Crompton, "Adaptive Antennas", John Wiley

Course Outcomes:

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

- Understand the properties and various types of antennas.
- Analyze the properties of different types of antennas and their design.
- Operate antenna design software tools and come up with the design of the antenna of required specifications.