Gurugram University Gurugram

Curriculum for UG Degree Course

in

Electronics and Computer Engineering

(Engineering & Technology)

Gurugram University Scheme of Studies and Examination
Bachelor of Technology (Electronics and Computer Engineering)

SEMESTER-V

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Operating System	3	0	0	3	30	70	100
2	PCC		Digital Signal processing	3	0	0	3	30	70	100
3	PCC		Computer Networks	3	0	0	3	30	70	100
4	PCC		Automata theory and compiler Design	3	0	0	3	30	70	100
5	OEC		Open Elective-I	3	0	0	3	30	70	100
6	PEC		Professional Elective - I	3	0	0	3	30	70	100
7	LC		Operating System Lab	0	0	2	1	50	50	100
8	LC		Computer Network Lab	0	0	2	1	50	50	100
9	LC		Digital Signal processing Lab	0	0	2	1	50	50	100
10	LC		Automata theory and compiler Design **Lab**	0	0	2	1	50	50	100
11	PT		Practical Training-I	0	0	2	-	30	70	100
Total				**28**			**23**	**410**	**690**	**1100**

NOTE:

1. Choose any one from Professional Elective Course-I
2. Choose any one from Open Elective Course-I

PROFESSIONAL ELECTIVE- I (Semester-V)

Sr. No	Code	Subject	Credit
1.		Electronic Measurement and Instrumentation	3
2.		Artificial Intelligence	3
3.		Object Oriented Programming using C++	3
4.		Mobile applications development	3
5.		Parallel Computing	3
6.		Digital System Design	3

OPERATING SYSTEM

Course code					
Category	Professional Core Courses				
Course title	Operating System				
Scheme and Credits	L	T	P	Credits	Semester: V
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES

1. To understand the fundamental concepts and techniques of Operating Systems.
2. To study the concepts of scheduling.
3. To be familiar with deadlocks and process management.
4. To analyze the concepts in memory managements and IPC mechanism

UNIT-I

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Multithreading.

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, SRTF, RR Scheduling.

UNIT-II

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT-III

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Optimal Page Replacement and Least Recently used (LRU).

UNIT-IV

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. Case study on UNIX and WINDOWS Operating System.

Comparative Study of Latest Operating System: Evolution, Architecture and Characteristics of various Operating systems like MS-Windows, Ubuntu, Mac OS, Fedora, Solaris, Free BSD, Chrome OS, CentOS, Debian, Deepin

COURSE OUTCOMES: **By the end of the course, a student would be able to:**

1. Analyze the structure and architectural components of OS to analyze and design the applications to run in parallel. Moreover, students would be able to develop scheduling algorithms to optimize various parameters like CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time for research purpose.
2. Understands the different services provided by Operating System at different level.
3. Understand the design issues associated with Operating system (e.g. Mutual exclusion, Deadlock detection etc.) to gain insight towards developing algorithms/techniques for efficient deadlock handling.
4. Develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
5. Design and implement file management system for a given specification. Identify, use and evaluate the disk management policies with respect to various performance evaluation parameters.
6. Learn real life applications of Operating System in every field

TEXT AND REFERENCE BOOKS:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin,Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings,Prentice Hall of India.
3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall ofIndia
6. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Digital Signal Processing

Course Code					Semester : V
Category	Professional Core Courses				
Course title	Digital Signal Processing				
Scheme	L	T	P	Credits	
	3	1	0	3	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To describe signals mathematically and understand how to perform mathematical operations on signals.
2. Get familiarized with various structures of IIR and FIR systems.
3. To discuss word length issues , multi rate signal processing and application.
4. Design and realize various digital filters for digital signal processing.

UNIT-I

Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems, frequency Analysis, Inverse Systems,

UNIT-II

Introduction to DFT: Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation.

UNIT-III

Structure of IIR: System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain. : Symmetric & Anti-symmetric FIR filters: Linear phase filter – Windowing techniques – rectangular, triangular, Blackman and Kaiser windows – Frequency sampling techniques – Structure for FIR systems.

UNIT-IV

Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors. Multi rate digital signal processing: Concepts, design of practical sampling rate converters, Decimators, interpolators. Polyphase decompositions. Application of DSP – Model of Speech Wave Form – Vocoder.

UNIT-I

COURSE OUTCOMES: After successful completion of the course, the students are able to

1. Interpret and analyze discrete time signals.
2. Compute Z transform.
3. Compute Discrete Fourier Transform.
4. Appreciate the importance of Fast Fourier Transform.
5. Design IIR and FIR filters.
6. Apply signal processing algorithms for real time applications.

Text Books

1. Digital Signal Processing A. Vallavaraj, C. Gnanapriya, and S. Salivahanan\
2. S.K. Mitra, Digital Signal Processing: A computer based approach.TMH
3. Oppenheim A V, Willsky A S and Young I T, “Signal & Systems”, Prentice Hall, (1983).
4. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.
5. DeFatta D J, Lucas J G and Hodgkiss W S, “Digital Signal Processing”, J Wiley and Sons, Singapore, 1988

Automata Theory and Compiler Design

Course code					
Category	Professional Core Courses				
Course title	Automata Theory and Compiler Design				
Scheme and Credits	L	T	P	Credits	Semester V
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Objectives of the course:

1. To get familiar with regular expressions to describe a language using automata.
2. Usage of context free grammars to describe the syntax of a language.
3. To learn different parsing techniques.
4. To provide techniques for syntactic, semantic language analysis, intermediate code Generation and optimization.

UNIT- I

Formal Language And Regular Expressions: Languages, Operations On Languages, Regular Expressions, Identity Rules For Regular Expressions, Finite Automata – DFA, NFA, Conversion Of Regular Expression to NFA, NFA To DFA. Introduction to Compilers: Phases of the Compiler. Syntax Analysis: Chomsky hierarchy of languages, Context-Free Grammars, CNF, GNF, Top-Down Parsing, Recursive Descent Parsers: LL (K) Parsers. Bottom-Up Parsing: Shift Reduces Parser, LR Parsers: SLR, CLR, LALR.

UNIT- II

Syntax Directed Translation: Syntax Directed Definition, Construction of Syntax Trees, L-Attributed Definitions. Intermediate Code Generation: Intermediate Languages, Translation of Assignment Statements and Boolean Expressions; Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA; Turing Machine- basic model, Design, Transition table and diagram, Halting problem

UNIT- III

Type Checking: Specification of Simple Type Checker, Equivalence of Type Expressions, Type Conversions Runtime Environments: Storage Organization, Storage Allocation Strategies, Access to Non-Local Names, Parameter Passing, Symbol Table, Dynamics Storage Allocation Techniques.

UNIT-IV

Code Optimization: Principal Sources Of Optimization, Optimization Of Basic Blocks, Loops In Flow Graphs, Global Data Flow Analysis, Peephole Optimization. Code Generation: Issues in Design of Code Generator, Simple Code Generator, Register Allocation and Assignment, DAG Representation of Basic Block, Generating Code from DAGs.

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

1. Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.
2. Understand the parser and its types i.e. Top,Down and Bottom,up parsers and construction of LL, SLR, CLR, and LALR parsing table
3. Understand the parser and its types i.e. Top,Down and Bottom,up parsers and construction of LL, SLR, CLR, and LALR parsing table.
4. Implement the compiler using syntax,directed translation method and get knowledge about the synthesized and inherited attributes.
5. Acquire knowledge about run time data structure like symbol table organization and different techniques used
6. Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization

Textbooks:

1. Introduction to Automata Theory, Languages, and Computation, 3nd Edition, John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Pearson Education.
2. Introduction to the Theory of Computation, Michael Sipser, 3rd edition, Cengage Learning.

Reference Books:

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
2. Raymond Greenlaw, H. James Hoover, Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
3. John C. Martin: Introduction to Languages and Automata Theory, 3rd edition, Tata McGraw-Hill, 2007
4. Principles of compiler Design, Narosa Publication
5. Elements compiler Design, Dr. M. Joseph, University Science Press

COMPUTER NETWORKS

Course Code					
Category	**Professional Core Courses**				
Course title	**Computer Network**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : V**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. To develop an understanding of modern network architectures from a design and Performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs).
3. To provide an opportunity to do Network programming.
4. To provide WLAN measurement ideas.

UNIT – I

Introduction: Data communication, Components, Data Representation, Simplex, Half Duplex, and Full Duplex Transmission, Modulation, Multiplexing, Computer networks, distributed processing, Internet, Topologies, Packet and circuit switching, connectionless and connection-oriented services.

Network Models: OSI model and TCP/IP Model

Physical Layer – LAN: Ethernet.

UNIT – II

Data Link Layer and Medium Access Sub Layer: MAC Addressing, Framing, Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window Protocol.

Medium Access Control: Random access, Controlled Access, and channelization protocols.

Network Layer: Logical addressing, classful and classless addressing, subnetting, Ipv4, ICMPv4, ARP, RARP and BOOTP, Ipv6, Ipv6 addressing.

UNIT – III

Network Devices: Repeater, hub, switch, router, and gateway.

Routing Algorithms: introduction to routing, Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State, and Distance Vector Routing

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP connection management.

UNIT – IV

Congestion Control, Quality of Service, QoS Improving techniques.

Application Layer: Domain Name Space (DNS), EMAIL, File Transfer Protocol (FTP), HTTP, SNMP

Network Security: Firewalls, security goals, types of attack, symmetric and asymmetric key ciphers.

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

1. Explain the functions of the different layers of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs), and Wireless LANs (WLANs) and describe the function of each.
3. Identify and connect various connecting components of a computer network.
4. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, and Firewalls using open-source available software and tools.
2. outline various models, topologies and devices of Computer Networks.
3. Design engineering solutions to complex problems utilizing a systems approach.

TEXT AND REFERENCE BOOKS:

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, latest Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, latest Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Digital Signal Processing Lab

Course Code					
Category	**Laboratory Courses**				
Course title	**Digital Signal Processing**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : V**
	3	**1**	**0**	**3**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	2Hrs				

Notes:
(i) At least 10 experiments are to be performed by students in the semester.
(ii) At least 7 experiments should be performed from the list, remaining three experiments

Course Objective: The objectives of this course are as under:

1. To describe signals mathematically and understand how to perform mathematical operations on signals using MATLAB.
2. Get familiarized with various structures of IIR and FIR systems.
3. To discuss word length issues , multi rate signal processing and application.
4. Design and realize various digital filters for digital signal processing.

List of Experiments

Experiments to be performed:
1. Represent basic signals (unit step, unit impulse, ramp, exponential, sine and cosine)
2. To develop program for Z-Transform
3. To develop program for Convolution of sequences
4. To develop program for Correlation of sequences
5. To develop program for DFT & IDFT of two sequences
6. To develop program for FFT of two Sequences
7. To develop program for Circular Convolution
8. To design analog filter (low-pass, high pass, band-pass, band-stop).
9. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).
10. To develop program for Interpolation and Decimation of sequences
11. To design FIR filters using windows technique.
12. Detection of Signals buried in Noise
13. Effect of noise on signals

Course Outcomes:
1. Ability to represent and analyze basic signals using MATLAB
2. Experiment concepts of DSP and its applications using MATLAB Software
3. To understand about the basic signal generation
4. Calculate linear and circular convolution of discrete sequences.
5. Implement Z transform and inverse Z transform of discrete signals
6. Model IIR and FIR filter using window techniques

.

COMPUTER NETWORKS LAB

Course code					
Category	**Laboratory Courses**				
Course title	Computer Networks Lab				
Scheme and Credits	L	T	P	Credits	Semester V
	0	0	2	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

1. To understand the functionalities of various layers of OSI model.
2. Understand fundamental underlying principles of computer networking.

CONTENTS:

1. Study of Socket Programming and Client – Server model
2. Write a code simulating ARP /RARP protocols.
3. Write a code simulating PING and TRACEROUTE commands
4. Create a socket for HTTP for web page upload and download.
5. Write a program to implement RPC (Remote Procedure Call)
6. Implementation of Sub netting .
7. Applications using TCP Sockets like a. Echo client and echo server b. Chat c. File Transfer
8. Applications using TCP and UDP Sockets like. DNS e. SNMP f. File Transfer
9. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector
11. To learn handling and configuration of networking hardware like RJ,45 connector, CAT,6 cable, crimping tool, etc.
12. Configuration of router, hub, switch etc. (using real devices or simulators)
13. Running and using services/commands like ping, traceroute, nslookup, arp, telnet, ftp, etc.
14. Network packet analysis using tools like Wireshark, tcpdump, etc.

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

1. Develop Client , Server architectures and prototypes by the means of correct standards and technology
2. .Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
3. Analyse & Implement various framing methods of Data Link Layer.
4. Demonstrate basic configuration of switches and routers.
5. Analyse & Implement various Error and flow control techniques.
6. Implement network routing and addressing techniques.

COMPUTER NETWORKS LAB

Course code					
Category	**Laboratory Courses**				
Course title	Computer Networks Lab				
Scheme and Credits	L	T	P	Credits	Semester V
	0	0	2	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

1. To understand the functionalities of different parsing techniques.
2. To learn and design techniques for syntactic, semantic language analysis, intermediate code Generation and optimization.

CONTENTS:

1. STUDY OF LEX AND YACC TOOLS.
2. TO CONVERT REGULAR EXPRESSION INTO NFA.
3. WRITE A PROGRAM TO FIND FIRST IN CFG.
4. WRITE A PROGRAM TO FIND STRING IS KEYWORD OR NOT.
5. WRITE A PROGRAM TO FIND STRING IS IDENTIFIER OR NOT.
6. WRITE A PROGRAM TO FIND STRING IS CONSTANT OR NOT.
7. WRITE A PROGRAM TO COUNT NO. OF WHITESPACES AND NEWLINE.
8. WRITE A PROGRAM TO GENERATE TOKENS FOR THE GIVEN GRAMMER.
9. WRITE AN ALGO TO CONVERT NFA TO DFA.
10. WRITE AN ALGO FOR MINIMIZING OF DFA.
11. WRITE A PROGRAM TO CHECK STRING IS IN GRAMMER OR NOT.
12. WRITE A PROGRAM TO CALCULATE LEADING FOR ALL NON TERMINALS .
13. WRITE A PROGRAM TO CALCULATE TRAILING FOR ALL NON TERMINAL.

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

1. Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc.
2. Understand the parser and its types i.e. Top,Down and Bottom,up parsers and construction of LL, SLR, CLR, and LALR parsing table.
3. Understands the conversions of automata.

PROFESSIONAL ELECTIVE –I

DIGITAL SYSTEM DESIGN

Course Code					
Category	**Professional Elective Courses**				
Course title	**Digital System Design**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : V**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To know the basic language features of Verilog HDL and the role of HDL in digital logic design.
2. To know the behavioural modeling of combinational and simple sequential circuits.
3. To know the behavioral modeling of algorithmic state machines.
4. To know the synthesis of combinational and sequential descriptions.
5. To know the architectural features of programmable logic devices.

UNIT I

Hardware modeling with the Verilog HDL: Encapsulation, modeling primitives, Types of Modelling. Logic system, Data types and operators.Behavioural descriptions in Verilog HDL.Styles for Synthesis of combinational logic and sequential logic. HDL based Synthesis – Technology Independent design

UNIT II

System Verilog standards, Key System Verilog enhancements for hardware design. Advantages of System Verilog over Verilog, Data Types: Verilog data types, System Verilog data types, 2 - State Data types, Bit, byte, shortint, int, longint. 4 - State data types. Logic, Enumerated data types, User Defined data types, Struct data types, Strings, Packages, Type Conversion: Dynamic casting, Static Casting, Memories: Arrays, Dynamic Arrays, Multidimensional Arrays, Packed Arrays, Associative Arrays, Queues, Array Methods, Tasks and Functions: Verilog Tasks and Functions

UNIT III

Verilog interface signals - Limitations of Verilog interface signals, SystemVerilog interfaces, SystemVerilog port connections, Interface instantiation. Interfaces Arguments, Interface Modports, Interface References, Tasks and functions in interface, Verilog Event Scheduler, SystemVerilog Event Scheduler, Clocking Block, Input and Output Skews, Typical Testbench Environment, Verification plan

UNIT IV

Random Variables - rand and randc, Randomize( ) Method - Pre/Post Randomize( ) methods, Constraints in the class, Rand mode and constraint mode, Constraint and Inheritance, Constraint Overriding, Set Membership, Distribution Constraints, Conditional Constraints - .implication (->), if/else, Inline Constraints

COURSE OUTCOMES: After successful completion of the course, the students are able to

1. Demonstate knowledge on HDL design flow,digital circuits design ,switch de-bouncing, metastability, memory devices applications
2. Can synthesis of combinational and sequential descriptions.
3. Design and develop the combinational and sequential circuits using behavioral modelling
4. Solving algorithmic state machines using hardware description language
5. Analyze the process of synthesizing the combinational and sequential descriptions
6. Memorizing the advantages of programmable logic devices and their description in Verilog

Reference Book

1. Samir Palnitkar "Verilog HDLA Guide to Digital Design Synthesis , " 2nd Edition, Pearson Education 2006.
2. Ashenden - Digital design,Elsevier
3. IEEE Standard VHDL Language Reference Manual latest edition
4. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.
5. "A VHDL Primmer" : Bhasker; Prentice Hall latest edition.
6. "Digital System Design using VHDL" : Charles. H.Roth ; PWS latest edition
7. "VHDL-Analysis & Modelling of Digital Systems" : Navabi Z; McGraw Hill.
8. VHDL-IV Edition: Perry; TMH latest edition
9. "Introduction to Digital Systems" : Ercegovac. Lang & Moreno; John Wiley latest edition
10. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH latest edition
11. Modern Digital Electronics- III Edition: R.P Jain; TMH latest edition.
12. Grout - Digital system Design using FPGA & CPLD 'S,Elsevier.

PARALLEL COMPUTING

Course code					
Category	Professional Elective -I				
Course title	Parallel Computing				
Scheme and Credits	L	T	P	Credits	Semester V
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. The objective of Parallel Computing is to enable students to understand and apply techniques for designing and developing efficient parallel algorithms and programs that can exploit the computational power of parallel computing systems.
2. The course aims to provide students with a comprehensive understanding of the principles, models, and technologies related to parallel computing.

UNIT -I

Introduction: Why parallel computing? Shared memory and distributed memory parallelism, Amdahl's law, speedup and efficiency, supercomputers.
Message Passing: MPI basics, point-to-point communication, collective communication, synchronous/asynchronous send/recv,algorithms for gather, scatter, broadcast, reduce.

UNIT -II

Parallel Communication: Network topologies, network evaluation metrics, communication cost, routing ininterconnection networks, static and adaptiverouting, process-to-processor mapping.

UNIT -III

Performance: Scalability, benchmarking, performance modelling, impact of network topologies, parallel code analysis and profiling.

UNIT -IV

Designing Parallel Codes: Domain decomposition, communication-to-computation ratio, load balancing, adaptivity, case studies: weather and material simulation codes.

Parallel I/O: MPI I/O algorithms, contemporary large-scale I/O architecture, I/O bottlenecks.

COURSE OUTCOME:

1.Students will demonstrate the ability to design and implement efficient parallel algorithms that can exploit the computational power of parallel computing systems.
2. Students will understand how to analyze and evaluate the performance and scalability of parallel algorithms and make informed design decisions.
3. Students will gain a solid understanding of parallel computing architectures and models, including shared memory, distributed memory, and hybrid models.
4. Students will be able to identify the characteristics, advantages, and limitations of different parallel computing architectures .
5. Able to choose the appropriate model for a given problem.
6. Understands technologies related to parallel computing

TEXT/REFERENCE BOOKS:

1.Peter S Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann, 2011.
2. DE Culler, A Gupta and JP Singh, Parallel Computer Architecture: A Hardware/Software Approach Morgan-Kaufmann, 1998.
3. Marc Snir, Steve W. Otto, Steven Huss-Lederman, David W. Walker and Jack Dongarra, MPI - The Complete Reference, Second Edition, Volume 1, The MPI Core.
4. William Gropp, Ewing Lusk, Anthony Skjellum, Using MPI : portable parallel programming with the message-passing interface, 3rd Ed., Cambridge MIT Press, 2014.
5. A Grama, A Gupta, G Karypis, and V Kumar, Introduction to Parallel Computing. 2nd Ed., Addison-Wesley 2003.
6. JLHennessy and DA Patterson, Computer Architecture: A Quantitative Approach, 4th Ed., Morgan Kaufmann/Els India, 2006.
7.MJ Quinn, Parallel Computing: Theory and Practice, Tata McGraw Hill, 2002.

Artificial Intelligence

Course code					
Category	Professional Elective -I				
Course title	Artificial Intelligence				
Scheme and Credits	L	T	P	Credits	Semester V
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. The course aims to introduce students to the field of artificial intelligence, its history, and its significance in various domains.
2. Students gain knowledge of the key AI techniques and algorithms, such as machine learning, natural language processing, computer vision, and robotics.
3. The course addresses the ethical considerations and social implications of AI technologies.

UNIT I

Overview of data communication model – Internet Multicasting, NAT, VPN – Routing Algorithms – BGP, RIP, OSPF – Differentiated and Integrated Services – SONET, ATM – MPLS -Next generation Internet architectures, Green Communication Networks, and Data Center Networking.

UNIT II

Analysis of Network congestion Mechanism, Routing algorithms, ARQ protocols Multimedia Networking; Implementation of multi-threaded Web Server/Web Proxy with Caching/Filtering features, Sliding Window protocol implementation, performance study of various TCP/IP variants.

UNIT III

Software Defined Network -Comparison between SDN and traditional networks -SDN controller, Switch design, SDN Controller-Switch Protocols, Open Flow Protocol, Control Overhead & Handoff algorithms.

UNIT IV

Network Function Virtualization -NFV Architecture, Use cases, NFV Orchestration and NFV for 5G.

COURSE OUTCOMES: At the end of course,

1. Students will be able to develop critical thinking and problem-solving skills in the context of AI.
2. Students will be able to develop and implement AI models to solve real-world problems.
3. They will have practical skills in data preprocessing, feature engineering, model training, and evaluation.
4. They should be able to interpret and analyze the results of AI models.
5. They should know difference between SDN and traditional networks

TEXTBOOK(S)

1. Tanenbaum AS, Wetherall DJ. Computer Networks. Fifth edition, Pearson Education, Inc. 2011.

REFERENCE BOOK(S)

1. Stallings W. Data and Computer Communications. Pearson Education India; 2006.
2. Douglas E Comer. Internet Working with TCP/IP Volume -1, Sixth Edition, Addison-Wesley Professional;2013.
3. Goransson P, Black C, Culver T. Software Defined Networks: a Comprehensive Approach. Morgan Kaufmann; 2014.
4. Chayapathi R, Hassan SF, Shah P. Network Functions Virtualization (NFV) with a Touch of SDN: Netw Fun Vir (NFV ePub_1. Addison-Wesley Professional; 2016 Nov 14.
5. Marschke D, Doyle J, Moyer P. Software Defined Networking (SDN): Anatomy of OpenFlow Volume 1. 2015.

Object Oriented Programming using C++

Course Code					
Category	Professional Elective Courses				
Course Title	**Object Oriented Programming using C++**				
Semester and Credits	L	T	P	Credits	Semester - V
	3	0	0	3	
Class Work	30 Marks				
Examination	70 Marks				
Total	100 Marks				
Duration of Exams	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objectives

- To learn how to overload functions and operators in C++.
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
- To learn how to use exception handling in C++ programs.

UNIT I

Introduction to C++ Procedural programming, Object based programming, Object Oriented Programming, Concepts in C++, Comparison of C++ with C, Console input/output in C++, Variables in C++, Data types in C++, operators in C++ , Statements-IF, ELSE, IF-ELSE, SWITCH, BREAK, CONTINUE, GOTO, Loops- WHILE.

UNIT II

Object Based Programming :Introduction to Classes and Objects, Member functions and member data, Objects and functions, Objects and arrays, Implicit this pointer, Class scope, Constructors and Destructors in Class, Copy constructor, Friend Class, Static Class members, Static Member functions, Nested Class.
Function, Arrays, Structure and Union :Function declaration, call, definition, recursion, one dimensional arrays, two dimensional arrays, searching and sorting, strings, structure & union.

UNIT III

Function Overloading and Operator Overloading :Overloading and scope, Function matching and argument conversions, three steps in overload resolution, argument type conversion, pointer to functions. Overloading Operators- Operator Overloading, Friend functions, Operator =, Operator [ ], Operator (), Operator ->, Operators ++ and --, Operators new and delete.

UNIT IV

Object Oriented Programming :Inheritance-Base class and derived class pointers, function overriding, base class initialization, protected access specifiers, different kinds of inheritance, Virtual functions- Need for virtual functions, Mechanism of virtual functions, Pure virtual functions.

Course Outcome: After completing this course, the students should be able to
CO 1: Describe OOPs concepts.
CO 2 :Use functions and pointers in your C++ program.
CO 3:Understand tokens, expressions, and control structures.
CO 4:Explain arrays and strings and create programs using them.
CO 5:Describe and use constructors and destructors.
CO 6:Understand and employ file management.

SUGGESTED READING/ BOOKS

1. Herbert Schildt, C++ The Complete reference, 4th Edition, TMH.
2. E. Balaguruswami, Object oriented programming using C++, TMH.
3. Bjarne Stroustroup, The C++ Programming language, Pearson Education.
4. Robert C Lafore, Turbo C++, Galgotia Publications.
5. E. Balaguruswami, Ansi C, TMH.

MOBILE APPLICATIONS DEVELOPMENT

Course code					
Category	Professional Elective Courses				
Course title	Mobile applications development				
Scheme and Credits	L	T	P	Credits	Semester: VI
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Introduce the students with the various "Next Generation Technologies" in the area of mobile computing
2. Assist students understand the various Mobile operating Systems
3. Explore the findings using Android Technologies

UNIT - I

Introduction: Mobile operating system, Operating system structure, Constraints and Restrictions, Hardware configuration with mobile operating system, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features

UNIT - II

Introduction to Mobile development IDE's, Introduction to Worklight basics, Optimization, pages and fragments , Writing a basic program- in Worklight Studio, Client technologies, Client side debugging, Creating adapters, Invoking adapters from Worklight Client application, Common Controls, Using Java in adapters, Programming exercise with Skins, Understanding Apache Cordova.

UNIT - III

Understanding Apple iOS development, Android development, Shell Development, Creating Java ME application, Exploring the Worklight Server, Working with UI frameworks, Authentication, Push notification, SMS Notifications, Globalization.

UNIT - IV

Android: Introduction to Android, Architecture, memory management, communication protocols, application development methods, deployment. iOS: Introduction to iOS, Architecture, memory management, communication protocols, application development methods, deployment

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

1. Explain the principles and theories of mobile computing technologies.
2. Describe infrastructures and technologies of mobile computing technologies.
3. List applications in different domains that mobile computing offers to the public, employees, and businesses.
4. Describe the possible future of mobile computing technologies and applications.
5. Effectively communicate course work through written and oral presentations

TEXT AND REFERENCE BOOKS:

1. Anubhav Pradhan, Anil V Deshpande, " Mobile Apps Development" Edition:
2. Jeff McWherter, Scott Gowell "Professional Mobile Application Development", John Wiley & Sons, 2012.
3. Barry Burd, "Android Application Development All in one for Dummies", Edition: I
4. Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS
5. Neal Goldstein, Tony Bove, "iPhone Application Development All-In-One For Dummies", John Wiley & Sons
6. Henry Lee, Eugene Chuvyrov, "Beginning Windows Phone App Development", Apress, latest edition.
7. Jochen Schiller,"Mobile Communications", Addison-Wesley, latest edition
8. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.

Electronic Measurement and Instrumentation

Course code					
Category	Professional Elective Courses				
Course title	**Electronic measurement and Instrumentation**				
Scheme and Credits	L	T	P	Credits	Semester V
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the fundamentals of Electronics Instruments and Measurement providing an in-depth understanding of Measurement errors.
2. Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers.
3. To address the underlying concepts and methods behind Electronics measurements.

UNIT -I

OSCILLOSCOPE:Block diagram, study of various stages in brief, high frequency CRO considerations. Sampling and storage oscilloscope.

GENERATION & ANALYSIS OF WAVEFORMS: Block diagram of pulse generators, signal generators, function generators wave analysers, distortion analysers, spectrum analyser, Harmonic analyser, introduction to power analyser.

UNIT -II

ELECTRONIC INSTRUMENTS:Instruments for measurement of voltage, current & other circuit parameters, Q meters, R.F. power measurements, introduction to digital meters.

FREQUENCY & TIME MEASUREMENT:Study of decade counting Assembly(DCA), frequency measurements, period measurements, universal counter, introduction to digital meters.

UNIT -III

DISPLAY DEVICES: Nixie tubes, LED's LCD's, discharge devices.

TRANSDUCERS: Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of
19 of 70 measurement of displacement, velocity, acceleration, strain, pressure, liquid level & temperature.

UNIT -IV

INTRODUCTION TO SIGNAL CONDITIONING: DC signal conditioning system, AC signal conditioning system, data acquisition and conversion system

Course Outcome:

1.Analyze the performance characteristics of each instrument
2. Illustrate basic meters such as voltmeters and ammeters.
3. Explain about different types of signal analyzers.
4. Explain the basic features of oscilloscope and different types of oscilloscopes
5. Identify the various parameters that are measurable in electronic instrumentation.
6. Employ appropriate instruments to measure given sets of parameters.

TEXT / REFERENCE **BOOK:**

1. A course in Electrical & Electronics Measurements & Instrumentation : A.K.Sawhney; Dhanpat Rai & Sons.
2, Electronics Instrumentation & Measurement Techniques : Cooper; PHI.

PRACTICAL TRAINING-I

Course Code					
Category	**PT**				
Course title	**Practical Training-I**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: V**
	2	**0**	**0**	**0**	
Class Work	30				
Exam	70				
Total	100				
Duration of Exam	3Hrs				

Note:The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.

The students are required to undergo practical training of duration not less than 1.5 months in a reputed organization or concerned institute. The students who wish to undergo practical training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the midterm progress report at the institute. the presentation will be attended by a committee. alternately the teacher may visit the industry to get the feedback of the student.

The final Viva voice of the practical training will be conducted by an external examiner and one external examiner appointed by the institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the board of studies in engineering and technology. Assessment of industrial training will be based on seminar, viva-voice, report and certificate of practical training obtained by the student from the industry or institute.

Gurugram University Scheme of Studies and Examination

Bachelor of Technology (Electronics and Computer Engineering)

SEMESTER-VI

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Control System Engineering	3	0	0	3	30	70	100
2	PCC		Microprocessor & Interfacing	3	0	0	3	30	70	100
3	PCC		Java Programming	3	0	0	3	30	70	100
4	PEC		Professional Elective II	3	0	0	3	30	70	100
5	PEC		Professional Elective III	3	0	0	3	30	70	100
6	OEC		OPEN ELECTIVE II	3	0	0	3	30	70	100
7	LC		Microprocessor & Interfacing LAB	0	0	2	1	50	50	100
8	LC		Java Programming Lab	0	0	2	1	50	50	100
9	LC		Control System Engineering Lab	0	0	2	1	50	50	100
10	PROJ		Project-I	0	0	4	2	50	50	100
11	MC		Economics for Engineers	2	0	0	-	30	70	100*
Total				**30**			**23**	**380**	**620**	**1000**

NOTE:

1. Economics for Engineers: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.
2. At the end of the 6th semester, each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training center etc. and submit the typed report along with a certificate from the organization and its evaluation shall be carried out in the 7th Semester.
3. Choose any one from each of the Professional Elective Course-II and III
4. Choose any one from Open Elective Course-II

PROFESSIONAL ELECTIVE- II (Semester-VI)

Sr. No	Code	Subject	Credit
1.		Neural Network	3
2.		Data Mining & Analytics	3
3.		Distributed Database	3
4.		Wireless Sensor Networks	3

PROFESSIONAL ELECTIVE- III (Semester-VI)

Sr. No	Code	Subject	Credit
1.		Nano electronics	3
2.		High Speed Electronics	3
3.		Biosensors	3
4.		Image Processing	3

CONTROL SYSTEM ENGINEERING

Course Code					
Category	**Professional Core Courses**				
Course title	**Control System Engineering**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To understand concepts of the mathematical modeling, feedback control and stability analysis in Time and Frequency domains
2. To develop skills, to analyze feedback control systems in continuous- and discrete time domains.
3. To learn methods for improving system response transient and steady state behavior (response).
4. The compensator design of linear systems is also introduced.

UNIT - I

Systems Components and Their Representation Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphsmodels-DC and AC servo Systems-Synchronous -Multivariable control system

UNIT-II

Time Response Analysis and Stability Concept Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type numer-PID control.

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus.

UNIT-III

Frequency Domain Analysis Bode Plot - Polar Plot- Nyquist Plots-Design of compensators using Bode Plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

UNIT-IV

Control System Analysis Using State Variable Methods State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controll ability and Observability -Stability of linear systems-Equivalence between transfer function and state variable representations

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

1. Understand the concepts of control systems and importance of feedback in control systems.
2. Perform signal flow graph and formulate transfer function.
3. Perform computations and solve problems on frequency response analysis.
4. Analyse Polar, Bode and Nyquist's plot.
5. Evaluate different types of state models and time functions.
6. Analyse different types of control systems like linear and non-linear control systems, etc.

Text/Reference Books:

1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997
2. Ambikapathy A., Control Systems, Khanna Book Publications, 2019.
3. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
4. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991.
5. Nagrath & Gopal, "Modern Control Engineering", New Age International, New Delhi
6. B.S Manke , Linear Control System, Khanna Publications.

MICROPROCESSORS AND INTERFACING

Course Code					
Category	**Professional Core Courses**				
Course title	**Microprocessors and Interfacing**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : VI**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course.

1. To develop an in-depth understanding of the operation of microprocessors.
2. To master the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts etc.
3. To create an exposure to basic peripherals, its programming and interfacing techniques.
4. To understand the concept of Interrupts and interfacing details of 8086 .

UNIT-I

THE 8086 MICROPROCESSOR ARCHITECTURE: Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals.

UNIT II

INSTRUCTION SET OF 8086: Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instructions, directives and operators, programming examples.

UNIT III

Concepts of virtual memory, Cache memory, Architecture & Instructions set of X86 family Microprocessors (80186, 80286, 80386, 80486). Enhanced features of Pentium, Pentium Pro, Pentium-II, Pentium-III, Pentium-IV, Multi-core Technology, Mobile Processor.

UNIT IV

INTERFACING DEVICE: Serial I/O, parallel I/O, A/D & D/A converters.8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

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

1. Understand the fundamentals of Microprocessors.
2. Understand the internal design of 8086 microprocessor along with the features .
3. Analyze a detailed s/w & h/w structure of the Microprocessor
4. Illustrate how the different peripherals (8086) are interfaced with Microprocessor.
5. Analyze the programming. of Microprocessors
6. Evaluate the data transfer information through serial & parallel ports.

Text / References Books:

1. Douglas Hall, "Microprocessor & Interfacing", 2nd Edition, TMH, 2006.
2. Muhammad A. Mazidi, "The 8051 Microcontroller And Embedded Systems Using Assembly and C", 2nd Edition., PHI, 2012.
3. Text / Reference Books: 1. D. V. Hall, Microprocessors and interfacing, Tata McGraw-Hill, 2nd Edition, 2006.
4. Ray A. K. and Burchandi, Advanced Microprocessors and Peripherals Architectures, Programming and Interfacing, Tata McGraw Hill, 2002.
5. Brey, The Intel Microprocessors 8086- Pentium Processor, 8th Edition, Pearson Education.
6. M. A. Mazidi, J. P. Maizidi and Danny Causey, The X86 PC: Assembly Language, Design and interfacing, 5th Edition, Pearson Education, 2017.
7. Liu Yu-Chang and Gibson Glenn A., Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design, 2nd Edition, Pearson Education, 2015.
8. L. B. Das, The X86 Microprocessor (Architecture, Programming and Interfacing), 2nd Edition, Pearson Education, 2014.
9. Daniel Tabak, Advanced Microprocessor", Tata McGraw-Hill, 2nd Edition, 2012.
10. B. Ram, Fundamentals of Microprocessor and Microcomputers, Dhanpat Rai Publications, 5th edition, 2008.

JAVA PROGRAMMING

Course code					
Category	**Professional Core Courses**				
Course title	**Java Programming**				
Scheme and Credits	**L**	**T**	**P**	**Credits**	**Semester VI**
	3	**0**	**0**	**3**	
Classwork	**30 Marks**				
Exam	**70 Marks**				
Total	**100 Marks**				
Duration of Exam	**03 Hours**				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Programming in the Java programming language,
2. Knowledge of object-oriented paradigm in the Java programming language,
3. The use of Java in a variety of technologies and on different platforms.

UNIT-I

Introduction to Java: Evolution of Java, Object Oriented Programming Structure, Over view and characteristics of Java, Organization of the Java Virtual Machine, Client side Programming

OOPS Implementation: Method Overloading, Static Data members, Static vs Dynamic Class loading, implicit vs explicit class loading, class loading operations ;Argument Passing Mechanism, Wrapper Classes; This key word ,Inheritance & codereusability, Usage of super keyword, Method Overriding ,Static & Dynamic binding, Interfaces, Need of Packages, associating classes to Packages, Class path environment variable

UNIT-II

Threads: Creating Threads,Thread Priority, Extending Thread Class ,Runnable Interface, Starting Threads, Thread Synchronization, Overriding Synced Methods, Thread Communication, wait, notify andnotifyall.

Exception Handling: exception and error, Exception Handling & Robustness, Common Exceptions and Errors, Try and catch block Exception handlers ,throw keyword, Roleoffinally, User defined Exceptions;

UNIT-III

Swing & AWT:

Swingclasshierarchy,containers,userinterfacecomponents,graphicscontext,AWTComponents, Component Class, Container Class, Layout Manager Interface Default Layouts, Insets and Dimensions, Border Layout, Flow Layout ,Grid Layout ,Card Layout Grid Bag Layout AWT Events, Event Models, Listeners, Class Listener, Adapters, Action Event Methods Focus Event Key Event ,Mouse Events, Window Event

Servlet: Servlet introduction, web terminology, servlet API, servlet Interface, generic servlet, Httpservlet, servlet lifecycle, servlet with IDE (eclipse, My eclipse, Net beans), servlet request, servlet collaboration, servlet configuration, context, attribute in servlet, session technique in servlet, event and listener, servlet filter, CRUD, pagination, inputoutputs tream, annotation, single thread model, SSI;

UNIT-IV

Hibernate(HB): Introduction, architecture, HB with IDE, HB Log4j, inheritance mapping, HB mapping, transaction management, HB query language, HB criteria query language, named query, HB caching, integration, HB lifecycle;

Spring: Introduction, modules, spring with IDE, dependency injection methods, spring AOP, spring Jdbc template, spring ORM, SPEL, MVC tag library, applications, spring remoting, spring OXM, spring web, security models, spring boot

COURSE OUTCOMES:

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

2. Use the syntax and semantics of java programming language and basic concepts of OOP.
3. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
4. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
5. Design event driven GUI and web related applications which mimic the real word scenarios.
6. Create dynamic web pages, using Servlets

TEXT BOOKS:

1. PatrickNaughtonandHerbertzSchidt,“Java-2thecompleteReference”,TMH
2. Sierra & bates, “Head First Java ”,O’ Reilly.

REFERENCEBOOKS:

1. E.Balaguruswamy ,“Programming with Java”, TMH
2. Horstmann,“ComputingConceptswithJava2Essentials”,JohnWiley.
3. Decker & Hirshfield ,“Programming .Java”, Vikas Publication.

Microprocessor &Interfacing LAB

Course code					
Category	**Laboratory Courses**				
Course title	Microprocessor & Interfacing LAB				
Scheme and Credits	L	T	P	Credits	Semester VI
	0	0	2	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

Note:

1 Total ten experiments are to be performed in the semester.

2 At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed and set by the concerned institution as per the scope of the syllabus.

Course Objectives: The objectives of this course are as under:

1. To introduce the students with 8086 kit.
2. To acquaint them to do assembly language programming of 8086.
3. To acquaint them to do assembly language programming of 8086 for interfacing of peripherals.

LIST OF EXPERIMENTS:

1. To study the architecture of 8086 microprocessor and 8086 microprocessor kit.
2. Write a program to add the contents of the memory location to the content of other memory location and store the result in 3rd memory location.
3. Write a program to add 16 bit number using 8086 instruction set.
4. Write a multiplication of two 16 bit numbers using 8086 instruction set.
5. Write a program for division of two 16 bit numbers using 8086 instruction set.
6. Write a program factorial of a number.
7. Write a Program to transfer a block of data with & without overlap.
8. Write a program to find the average of two numbers.
9. Write a Program to check whether data byte is odd or even
10. Write a program to find maximum number in the array of 10 numbers.
11. Write a program to find the sum of the first ‘n’ integers.
12. Write a program to generate a square wave.
13. Write a program to generate a rectangular wave.
14. Write a program to generate a triangular wave.

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

1. Do assembly language programming of 8086.
2. Do assembly language programming of 8086 for interfacing of peripherals.

JAVA PROGRAMMING LAB

Course code					
Category	**Laboratory Courses**				
Course title	Advanced Java Lab				
Scheme and Credits	L	T	P	Credits	Semester VI
	0	0	2	2	
Classwork	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	02 Hours				

COURSE OBJECTIVES:

1. To Understand OOP concepts and basics of Java programming.
2. To create Java programs using inheritance and polymorphism.
3. To Implement error-handling techniques using exception handling and multithreading.
4. To develop GUI using Swing components

CONTENTS:

1. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
2. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.
3. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
4. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
5. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.
6.
   b. Write a Java program to demonstrate the mouse event handlers.
   c. Write a Java program to demonstrate the key event handlers.
7. .Write a program to implement JTable using swings.
8. a) Write a servlet program to create a simple servlet and test it?

   b).Write a servlet program to read the client request parameters.

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

1. ..Use Java compiler and eclipse platform to write and execute java program.
2. Understand and Apply Object oriented features and Java concepts.
3. Apply the concept of multithreading and implement exception handling.
4. Develop GUI using Swing components.
5. Implement server side programming

CONTROL SYSTEM LABORATORY

Course Code						
Category	**Laboratory Courses**					
Course title	**Control System Laboratory**					
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**	
	0	**0**	**2**	**1**		
Class Work	50 Marks					
Exam	50 Marks					
Total	100 Marks					
Duration of Exam	2Hrs					

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus. Group of students for practical should be 15 to 20 in number.

LIST OF EXPERIMENTS: ANY SIX EXPERIEMENTS

1. To study speed Torque characteristics of
   a) A.C. servo motor
   b) DC servo motor.
2. (a) To demonstrate simple motor driven closed loop DC position control system.
   (b) To study and demonstrate simple closed loop speed control system.
3. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots.
4. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing number of steps, direction of rotation & speed.
5. To implement a PID controller for temperature control of a pilot plant.
6. To study behavior of 1st order, 2nd order type 0, type 1 system.
7. To study control action of light control device.
8. To study water level control using a industrial PLC.
9. To study motion control of a conveyor belt using an industrial PLC

SOFTWARE BASED (ANY FOUR EXPT.)

Introduction to SOFTWARE (Control System Toolbox)

10. Different Toolboxes in SOFTWARE, Introduction to Control Systems Toolbox.
11. Determine transpose, inverse values of given matrix.
12. Plot the pole-zero configuration in s-plane for the given transfer function. Plot unitstep response of given transfer function and find peak overshoot, peak time.
13. Plot unit step response and to find rise time and delay time.
14. Plot locus of given transfer function, locate closed loop poles for different values ofk.
15. Plot root locus of given transfer function and to find out S, Wd, Wn at given root & todiscuss stability.
16. Plot bode plot of given transfer function and find gain and phase margins Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/ disallowed.

Lab Outcomes: At the end of this lab students will demonstrate the ability to

1. Understand the concepts of control systems and importance of feedback in control systems.
2. Perform signal flow graph and formulate transfer function.
3. Perform computations and solve problems on frequency response analysis.
4. Analyse Polar, Bode and Nyquist's plot.
5. Evaluate different types of state models and time functions.
6. Analyse different types of control systems like linear and non-linear control systems, etc

PROJECT-I

Course Code					
Category	**Project**				
Course title	**Project-I**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Course objectives:

1. To allow students to demonstrate skills learned during their course of study by asking them to deliver a product that has passed through the design, analysis, testing and evaluation
2. To encourage research through the integration learned in a number of courses.
3. To allow students to develop problem solvingskills.
4. To encourage teamwork.
5. To improve students' communication skills by asking them to produce both a professional report and to give an oral presentation and prepare a technical report.

The students are required to undertake institutional project work.

The final Viva voice of the institutional project work will be conducted by an external examiner and one external examiner appointed by the institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the board of studies in engineering and technology. Assessment of institutional project work will be based on seminar, viva-voice and report of institutional project work obtained by the student from the industry or institute.

The internal marks distribution for the students consists of 50 marks internally and 50 marks by an external examiner.

Course outcomes

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

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification and formulation.
3. Design engineering formula to complex problems utilising a systems approach.
4. Researchand engineering project.
5. Communicate with engineers and the community at large in written and oral form.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer.

ECONOMICS FOR ENGINEERS

Course Code					
Category	**Non-Credit**				
Course title	**Economics for Engineers**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	2	**0**	**0**	**0**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: *** Economics for Engineers: Non-credit mandatory course, students have to attain pass marks (40%)**

Course Objectives:

1. Acquaint the students to basic concepts of economics and their operational significance.
2. Acquaint students with market and its operation.
3. To stimulate the students to think systematically and objectively about contemporary economic problems.

Unit-1

Definition of Economics- Various definitions, types of economics- Micro and Macro Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand- Meaning of Demand, Law of Demand, Elasticity of Demand- meaning, factors effecting it, its practical application and importance.

Unit-2

Production- Meaning of Production and factors of production, Law of variable proportions, Returns to scale, Internal and external economies and diseconomies of scale.Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Real cost, accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

Unit-3

Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

Unit-4

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalization of Indian economy - merits and demerits. Banking- Concept of a Bank, Commercial Bank- functions, Central Bank- functions, Difference between Commercial & Central Bank.

Course outcomes:

1. The students will able to understand the basic concept of economics.
2. The students will able to understand the basic concept of demand.
3. The student will able to understand the concept of production and cost.
4. The student will able to understand the concept of market.
5. The students will able to understand the basic concept of supply.
6. The student will able to understand the concept of privatization, globalization and banks.

Text / References Book:

1. Jain T.R., Economics for Engineers, VK Publication.
2. Chopra P. N., Principle of Economics, Kalyani Publishers.
3. Dewett K. K., Modern economic theory, S. Chand.
4. H. L. Ahuja., Modern economic theory, S. Chand.
5. Dutt Rudar & Sundhram K. P. M., Indian Economy.
6. Mishra S. K., Modern Micro Economics, Pragati Publications.
7. Singh Jaswinder, Managerial Economics, dreamtech press.
8. A Text Book of Economic Theory Stonier and Hague (Longman's Landon).
9. Micro Economic Theory – M.L. Jhingan (S.Chand).
10. Micro Economic Theory - H.L. Ahuja (S.Chand).
11. Modern Micro Economics: S.K. Mishra (Pragati Publications).

Professional Elective –II

NEURAL NETWORKS

Course code					
Category	Professional Elective Course				
Course title	Neural Networks				
Scheme and Credits	L	T	P	Credits	Semester : VI
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand the different issues involved in the design and implementation of neural networks
2. To study the basics of neural Networks and its activation functions.
3. To understand concept of perceptron and its application in real world.
4. To introduce techniques used for training artificial neural networks.
5. To implement design of an artificial neural network and build a NN model to solve a problem.

UNIT I

Introduction to ANN: Need of Artificial Neural Network, Biological Neurons and Memory, Structure & Function of a single Neuron, Biological neuron equivalencies to artificial neuron model, Evolution of neural network, Application of Artificial Neural Network

Models of Artificial Neuron & activation functions

UNIT II

McCulloch and Pits Neural Network (MCP Model): Architecture, Solution of AND, OR, XOR function using MCP model,

Hebb Model: Architecture, training and testing, Hebb network for AND, OR function.

Supervised Learning Network: Architecture of Perceptron Network, training and Testing algorithm for single output and multi-output model. Adaptive Linear Neuron (Adaline): Architecture, training and Testing algorithm

UNIT III

Learning Rules: Introduction to learning and type of learning, Hebbian Learning Rule, Perceptron Learning Rule, Correlation Learning Rule, Delta Learning Rule, Competitive Learning Rule

Back propagation Network: Back Propagation networks, Architecture of Back-propagation(BP) Networks, Back-propagation Learning

UNIT IV

Associative Memory Networks: Auto associative and Hetro associative memory and their architecture, training (insertion) and testing (Retrieval) algorithm using Hebb rule and Outer Product rule. Storage capacity, testing of associative memory for missing and mistaken data, Bidirectional Associative memory

CO1: Understand the difference between biological neuron and artificial neuron.

CO2: Familiar with different Neural network Models
CO3: Understand the concept of learning in Neural Network.
CO4: Understanding of CNN and RNN to model for real-world applications.
CO5: Analyse the given conceptual problem and able to visualize in Neural Network
CO6: Understand the associative memory and its architecture.

TEXT AND REFERENCE BOOKS:

1. Introduction to artificial Neural systems by Jacek M. Zurada, 1994, Jaico Publ. House.
2. Principles of Soft Computing by S.N. Deepa, S.N. Sivanandam., Weley publication.
3. "Neural Networks: A Comprehensive formulation", Simon Haykin, 1998
4. "Neural Networks", Kosko, 1992, PHI.
5. "Neural Network Fundamentals" – N.K. Bose , P. Liang, 2002, T.M.H
6. Neural Network To design and build a simple NN model to solve a problem, T.N.Shankar, University Science Press
7. Neuro Fuzzy Systems, Lamba, V.K., University Science Press

DATA MINING & ANALYTICS

Course code					
Category	Professional Elective Course				
Course title	Data Mining & Analytics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. The objective of a Data Mining course is to provide students with a comprehensive understanding of the concepts, techniques, and applications of data mining.
2. The course aims to equip students with skills in exploratory data analysis.
3. he objective is to familiarize students with data preprocessing techniques.

UNIT I

What is Data mining ? Kinds of data meant for mining , Kinds of patterns that can be mined, Applications suitable for data mining, Issues in Data mining, Data objects and Attribute types, Statistical descriptions of data, Need for data preprocessing and data quality, Data cleaning, Data integration, Data reduction, Data transformation

UNIT II

Mining frequent patterns: Basic concepts , Market Basket Analysis, Frequent itemsets, Closed itemsets, Association rules,Introduction, Apriori algorithm,theoritical approach, Apply Apriori algorithm on datasets Generating Association rules from frequent itemsets, Improving efficiency of Apriori, Pattern growth approach, Strong rules vs. weak rules, Association analysis to Correlation, analysis Comparison of pattern evaluation measures.

UNIT III

Classification: Basic concepts , General approach to Classification, Decision tree induction, Algorithms and numerical examples for Decision tree induction, Attribute selection measure, Tree pruning, Bayes' Theorem Naïve Bayesian Classification , IF,THEN rules for classification, Metrics for evaluating classifier performance, Cross validation, Bootstrap, Ensemble methods,Introduction, Bagging and Boosting

UNIT,IV

Cluster Analysis: Introduction, Requirements and overview of different, categories, Partitioning method: Introduction, k,means, k,medoids, Hierarchical method: Introduction, Agglomerative vs. Divisive method, Distance measures in algorithmic methods, BIRCH technique, DBSCAN technique, STING technique, CLIQUE technique, Evaluation of clustering techniques

COURSE OUTCOME:

CO1	Students will develop a solid understanding of the fundamental concepts, principles, and techniques used in data mining.
CO2	Students will grasp the process of discovering patterns, relationships, and insights from large datasets.
CO3	Students will gain skills in data preprocessing, including handling missing data, dealing with outliers, and transforming data into suitable formats for data mining algorithms.
CO4	Students will understand the importance of data quality and learn techniques to improve data quality for accurate analysis.

TEXT/REFERENCE BOOKS:

1. Jiawei Han and Micheline Kamber, " Data Mining: Concepts and Techniques", 3rd Ed, Morgan Kauffman Publishers, 2011.
2. L. Bing Web Data Mining Springer,Verlag,2017.
3. P. Ponniah, Data Warehousing, (2e), Wiley India Pvt. Ltd., 2011
4. A.K. Pujari, Data Mining Techniques (4e), Orient Black Swan/ Universities Press 2016.
5. N.T. Pang, M. Steinbach, K. Anuj and V. Kumar., Introduction to Data Mining, Pearson Education 2nd Ed, Pearson 2018

WIRELESS SENSOR NETWORKS

Course code					
Category	Professional Elective Course				
Course title	Wireless Sensor Networks				
Scheme and Credits	L	T	P	Credits	SEMESTER: VI
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. Learn Ad hoc network and Sensor Network fundamentals
2. Understand the different routing protocol
3. Have an in-depth knowledge on sensor network architecture and design issue.
4. Understand the transport layer and security issues possible in Ad hoc and Sensor networks
5. Have an exposure to mote programming platforms and tool

UNIT I

Introduction to Ad Hoc Networks: Characteristics of MANETs, Applications of MANETs and challenges of MANETs, Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology basedroutingalgorithms,Positionbasedroutingalgorithms,Otherrouting algorithms.

UNIT II

Data Transmission: Broadcast storm problem , Broadcasting ,Multicasting and Geo casting TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Adhoc

UNIT III

Basics of Wireless, Sensors and Applications: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer ,Link layer.

UNIT IV

Data Retrieval in Sensor Networks: Routing layer, Transport layer, High ,level applicationlayersupport;Adaptingtotheinherent;dynamicnatureofWSNs;SensorNetworksandmobilerobots.Security:SecurityinAdHocnetworks,Keymanagement,Securerouting,CooperationinMANETs,IntrusionDetectionsystems.

Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, SensorNetworkProgrammingChallenges,Node,LevelSoftwarePlatforms,OperatingSystem:TinyOS– ImperativeLanguage:nesC,Dataflowstylelanguage:TinyGALS,Node,LevelSimulators,ns2anditssensor

networkextension,TOSSIM.

COURSE OUTCOMES:

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

CO1: Understand the needs of Wireless Adhoc and Sensor Network in current scenario.

CO2: Describe current technology trends for the implementation and deployment of wireless Adhoc/sensor networks.

CO3: Discuss the challenges in designing MAC, routing.

CO4: Transport protocols for wireless Ad-hoc/sensor networks.

CO5: Explain the principles and characteristics of wireless sensor networks.

TEXT/ REFERENCE BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio DharmaP.Aggarwal,WorldScientificPublications,March2006,ISBN–981,256,681,3

2. WirelessSensorNetworks:AnInformationProcessingApproach,FengZhao,Leonidas Guibas,ElsevierScience,ISBN–978,1,55860,914,3(MorganKauffman

DISTRIBUTED SYSTEM

Course code					
Category	Professional Elective Course				
Course title	Distributed System				
Scheme and Credits	L	T	P	Credits	SEMESTER: VI
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVE:

1. The objective of a Distributed Systems course is to provide students with a comprehensive understanding of the principles, concepts, and challenges associated with designing, implementing, and managing distributed computing systems.
2. The course objective is to introduce students to the fundamental concepts of distributed systems.

UNIT I

Introduction: Distributed Operating Systems Definition and goals, Hardware and Softwareconcepts,Designissues.

Communication in Distributed System: Computer Network and Layered protocols, Messagepassingandrelatedissues,synchronization,ClientServermodel&itsimplementation,remoteprocedure calland implementation issues,Case Studies:SUNRPC,DECRPC

UNIT II

SynchronizationinDistributedSystem:Clocksynchronizationandrelatedalgorithms,mutualexclusion, Deadlockin distributedsystems

ProcessesandprocessorsinDistributedsystems: Threads,systemmodel,processorallocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, realtime distributed systems, Process migration and related issues

UNIT III

Distributed File systems: Introduction, features & goal of distributed file system, filemodels, file accessing models, file sharing semantics, file caching scheme, file replication,fault tolerance, trends indistributedfile system,case study.

Distributed Shared Memory: Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing

UNIT IV

Security Issues: Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management

DistributedWeb,basedSystems: Architecture,Processes,Communication,Naming,Synchronization CaseStudies: JAVARMI,SunNetwork FileSystem,Google CaseStudy

COURSE OUTCOME:

CO1	Students will develop a solid understanding of the fundamental concepts, principles, and challenges associated with distributed systems.
CO2	Students will grasp the concepts of scalability, fault tolerance, concurrency, and consistency in distributed computing environments.
CO3	Students will gain knowledge of various communication and coordination mechanisms used in distributed systems.
CO4	Students will learn about message passing, remote procedure calls (RPC), distributed transactions, and distributed consensus algorithms.
CO5	Students will understand how these mechanisms enable communication and coordination among distributed components.

TEXT/REFERENCE BOOKS:

1. Distributed Operating Systems by Andrew S Tannebaum, Pearson
2. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
3. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore, TimKindberg, Pearson
4. Distributed Computing by Sunita Mahajan & Seema Shah OXFORD
5. Distributed Systems: Principles and Paradigms by Andrew S Tanebaum, Maarten Van Steen, PHI
6. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, HagitAttiya and Jennifer Welch, Wiley India

NANO ELECTRONICS

Course Code					
Category	**Professional Elective Courses**				
Course title	**Nano Electronics**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To understand various aspects of nano-technology and the processes involved inmaking nano components and material.
2. Toleverage advantages of the nano-materials and appropriate use in solvingpractical problems.
3. To understand various aspects of nano-technology.
4. To understand the processes involved inmaking nano components and material.

Unit-I

Introduction to nanotechnology, applications of nano electronics. Basics of QuantumMechanics: Wave nature of particles and wave-particle duality, Pauli Exclusion Principle,wave functions and Schrodinger's equations, Density of States, Band Theory of Solids,Particle in a box Concepts

Unit-II

Shrink-down approaches: CMOS scaling: advantages and limitations. Nanoscale MOSFETs,FINFETs, Vertical MOSFETs, system integration limits (interconnect issues etc.)

Unit-III

Nanostructure materials, classifications of nanostructure materials, zero dimensional, onedimensional, two dimensional and three dimensional, properties and applicationsCharacterization techniques for nanostructured materials: SEM, TEM and AFM

Unit-IV

Nano electronics devices: Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Singleelectron transistors, Carbon nanotube electronics, Band structure and transport, devices,applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation

Course Outcomes:

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

1. Understand various aspects of nano-technology.
2. Understand processes involved inmaking nano components and material.
3. Leverage advantages of the nano-materials and appropriate use in solvingpractical problems.
4. Understand various aspects of nano-technology and
5. Understand the processes involved inmaking nano components and material.
6. Analyse Nano Electronic devices.

Text/ reference books:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, latest edition
2. W. Ranier, Nanoelectronics and Information Technology (AdvancedElectronic Materialand Novel Devices), Wiley-VCH, latest edition
3. K.E. Drexler, Nanosystems, Wiley, latest edition
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, CambridgeUniversity Press, latest edition
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, latest edition

HIGH SPEED ELECTRONICS

Course Code					
Category	**Professional Elective Courses**				
Course title	**High Speed Electronics**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To Study the high-speed electronics system.
2. To Understand Radio frequency amplifiers.
3. To analyse mixers.
4. Learn the fabrication process.

Unit-I

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

Unit-II

Noise Analysis: Sources, Noise Figure, Gain compression, Harmonic distortion, Inter -modulation, Cross-modulation, Dynamic range.
Devices: Passive and active, Lumped passive devices (models), Active (models, low vs High frequency)

Unit-III

RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed)Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-overdistortion Efficiency RF power output stages.
Mixers –Up conversion Down conversion, Conversion gain and spurious response. OscillatorsPrinciples.PLL Transceiver architectures.

Unit-IV

Printed Circuit Board Anatomy, CAD tools for PCB design, Standard fabrication, Microvia Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges.

Course Outcomes:

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

1. Study the high-speed electronics system.
2. Understand significance and the areas of application of high-speed electronics circuits.
3. Understand the properties of various components used in high-speed electronics.
4. Understand Radio frequency amplifiers.
5. Analyse Mixers.
6. Design High-speed electronic system using appropriate components.

Text/ reference books:

1. Stephen H. Hall, Garrett W. Hall, James A. McCall “High-Speed Digital System Design: AHandbook of Interconnect Theory and Design Practices”, August 2000, Wiley-IEEE Press.
2. Thomas H. Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”,CambridgeUniversity Press, 2004, ISBN 0521835399.
1. Behzad Razavi, “RF Microelectronics”, Prentice-Hall 1998, ISBN 0-13-887571-5.
2. Guillermo Gonzalez, “Microwave Transistor Amplifiers”, 2nd Edition, Prentice Hall.
3. Kai Chang, “RF and Microwave Wireless systems”, Wiley.
4. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011

PROFESSIONAL ELECTIVE-III

SOFTWARE TESTING

Course code					
Category	Professional Elective Courses				
Course title	Software Testing				
Scheme and Credits	L	T	P	Credits	Semester: VI
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To study fundamental concepts of software testing including software testing OBJECTIVESs, process, criteria, strategies, and methods.
2. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
3. To gain an insight into techniques and skills on how to use modern software testing tools to support software testing projects.

UNIT - I

Introduction: Overview of Software Development Life Cycle (SDLC), Significance of Software Testing in SDLC, OBJECTIVESs and Limitations of software testing. Difference between an Error, Fault and Failure (Software Bug), Software Testing Life Cycle (STLC) and Seven Principles of Software Testing, Role of Software Testing in Software Quality

UNIT - II

Test Case Design: Test Cases and Test Suite, Test Case Planning and Designing, Characteristics of Good Test Case Design, Format of test case.

Testing Activities: Levels of Testing- Unit, Integration Testing and System Testing. V Model for Software Testing.

UNIT - III

Types of Software Testing: Black box testing, White Box and Gray Box Testing.

Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools.

UNIT - IV

Types of Software Testing: Black box testing, White Box and Gray Box Testing.

Reporting and Analyzing bugs: Problem reports, Content and Characteristics of Problem Report, analysis and Tactics for analyzing a reproducible bug. Making a bug reproducible, Problem/Bug Reporting tools.

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

CO1: Understand software testing and quality as a fundamental component of software development life cycle.

CO2: Understand and design the test cases for a given problem

CO3: Understand the process of Reporting of software failures(bugs) using tools like Bugzilla

CO4: Develop the knowledge of selection of appropriate test cases for execution during regression testing.

CO5: Compare and contrast the various activities of Quality Assurance, Quality planning and Quality Control.

CO6: Conduct formal inspections, record and evaluate results of inspections.

TEXT AND REFERENCE BOOKS:

1. "Software Testing: Principles and Practices", by Naresh Chauhan. Oxford University Press
2. "William Perry, Effective Methods for Software Testing, John Wiley & Sons, New York, 1995.
3. Boris Beizer, Software Testing Techniques, Second Volume, Second Edition, Van Nostrand Reinhold, New York, 1990.
4. Louise Tamres, Software Testing, Pearson Education Asia, 2002
5. Roger S. Pressman, Software Engineering – A Practitioner's Approach, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
6. Boris Beizer, Black-Box Testing – Techniques for Functional Testing of Software and Systems, John Wiley & Sons Inc., New York, 1995.
7. K.K. Aggarwal & Yogesh Singh, Software Engineering, New Age International Publishers, New Delhi, 2003.

COMPUTER GRAPHICS

Course code					
Category	Professional Elective Courses				
Course title	Computer Graphics				
Scheme and Credits	L	T	P	Credits	Semester: VI
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To have basic understanding of the core concepts of Computer Graphics.
2. Understand scan conversion, 2D, 3D – transformation and viewing.
3. To be able to create interactive computer Graphics with understanding of shading, image processing and illumination model.

UNIT - I

Introduction to Computer Graphics: What is Computer Graphics, Computer Graphics Applications, Computer Graphics Hardware and software; Two dimensional Graphics Primitives: Points and Lines, Scan Conversion: Point, Line, Circle; Region Filling: Scanline algorithm, Polygon filling algorithm, boundary filled algorithm.

UNIT - II

Two dimensional transformations: Geometric, Coordinate and, composite transformation.

Two Dimensional Viewing: window to view port mapping; Clipping: point, line, polygon, curve and text clipping

UNIT - III

Three-dimensional transformations: Three dimensional graphics concept, Geometric and Coordinate transformations, Viewing in 3D: Projection, Taxonomy of projection,

Hidden surface removal: Introduction to hidden surface removal, The Z- buffer algorithm, The painter's algorithm, Scanline algorithm, Sub-division algorithm.

UNIT - IV

Representing Curves and Surfaces: Parametric representation of curves: Bezier curves, BSpline curves. Parametric representation of surfaces; Interpolation method.

Illumination, shading, image manipulation: Illumination models, shading models for polygons, shadows, transparency, image processing.

COURSE OUTCOMES:

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

CO1: ***Understand and apply*** basics about computer graphics along with graphics standards.

CO2: Understanding of the software, hardware and applications of Computer Graphics.

CO3: Understanding of Scan conversion, 2D, 3D – transformation and viewing.

CO4: ***Understand*** various colour models in computer graphics system and develop animated motions through OpenGL.

CO5: To be able to implement picture on screen using projection, shading, image processing and illumination model.

TEXT AND REFERENCE BOOKS:

1. Computer Graphics Principles and Practices second edition by James D. Foley, Andeies van Dam, Stevan K. Feiner and Johb F. Hughes, 2000, Addision Wesley.
2. Computer Graphics by Donald Hearn and M.Pauline Baker, 2 Edition, 1999, PHI
3. Computer Graphics by Z. Xiang, R. Plastock, 2nd Edition, TMH Education.
4. Procedural Elements for Computer Graphics – David F. Rogers, T.M.H latest Edition
5. Fundamentals of 3-Dimensional Computer Graphics by Alan Watt, Addision Wesley.
6. Computer Graphics: Secrets and Solutions by Corrign John, BPB
7. Graphics, GUI, Games & Multimedia Projects in C by Pilania&Mahendra, Standard Publ.
8. Computer Graphics Secrets and solutions by Corrign John, BPV
9. Introduction to Computer Graphics by N. Krishanmurthy T.M.H latest edition

BIOSENSORS

Course Code					
Category	**Open Elective Courses**				
Course title	**Biosensors**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To understand the basic principles and classification of sensors and measurands.
2. To know the hardware and software of DAQ system and Electronic Interface systems
3. To understand how to measure various parameters and helps to design simple biomedical sensors.
4. To study about the sensor measurements for biological applications.

UNIT-I

Overview of biosensors and their electrochemistry: Molecular reorganization: Enzymes, Antibodiesand DNA, Modification of bio recognition molecules for Selectivity and sensitivity, Fundamentals ofsurfaces and interfaces

UNIT-II

Bioinstrumentation and bioelectronics devices: Principles of potentiometry and potentiometricbiosensors, Principles of amperometry and amperometric biosensors, Optical Biosensors based onFiber optics, Introduction to Chemometrics, Biosensor arrays; Electronic nose and electronic tongue.

UNIT-III

Iron-Selective Field-Effect Transistor (ISFET), Immunologically Sensitive Field Effect Transistor(IMFET). Fabrication and miniaturization techniques.

UNIT-IV

Sensor-to-Frequency Conversion Data-Acquisition Systems: Hardware and Software of DataAcquisition System (DAS), Electronic Interface, Integrated Sensors, Wireless integration. Smartsensor, Nano sensor.

Course Outcomes:

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

1. Understand the basic principles and classification of sensors and measurands.
2. Understand the hardware and software of DAQ system and Electronic Interface systems.
3. Understand how to measure various parameters and helps to design simple biomedical sensors.
4. Explain the concept of molecular reorganization, fundamentals of surfaces and interfaces.
5. Elucidate the principles of different types of biosensors
6. Understand sensor measurements for biological applications.

Text Books

1. Gardner, J.W., Microsensors, Principles and Applications, John Wiley and Sons(1994).
2. Kovacs, G.T.A., Micromachined Transducer Sourcebook, McGrawHill (2001).
3. Turner, A.P.F., Karube,I., and Wilson G.S., BiosensorsFundamentals and Applications, OxfordUniversity Press (2008)
4. Jon Cooper, Biosensors A Practical Approach, Bellwether Books
5. Manoj Kumar Ram, Venkat R, Bhethanabolta, Sensors for chemical and biological applications,CRC Press

IMAGE PROCESSING

Course Code					
Category	**Open Elective Courses**				
Course title	**Image Processing**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VI**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To understand need for image transforms different types of image transforms and theirproperties.
2. Analyse image processing application and Machine vision.
3. Implementing image compression and spatial and frequencydomain techniques of image compression.
4. To understand different feature extraction techniques.

UNIT-I

INTRODUCTION: Image Processing Fourier Transform and Z-Transform Causality and stability Toeplitand Circulate Metrics orthogonal and unitary Matrices and Kronecker product, Markov Processes KITransform Mean square Estimates and Orthogonal Principles.

IMAGE SAMPLING QUANTIZATION: Band Limited Image Sampling Versus Replication, Reconstruction ofImage from samples Sampling Theorem, Sampling Theorem for Random Fields, Optimal Sampling,Nonrectangular Grid Sampling, Sampling Aperture, Display Aperture/ Interpolation Functions, LagrangeInterpolation Moire Effect. Image Quantization Uniform Optimal Quantizer, Properties of Mean SquareQuantizer, Commander Design Visual Quantization

UNIT-II

IMAGE TRANSFORMS: Two Dimensional Orthogonal and Unitary Transforms and their properties. One-dimensional and Two Dimensional DFT Cosine and Sine Transforms.Hadamard, Slant, Harr and KL,Transforms and their properties, Approximation to KI Transforms.

IMAGE REPRESENTATION BY STOCHASTIC MODELS: One Dimensional Causal Models, AR and ARMAmodels, Non Causal Representation Spectral factorization, Image Decomposition.

UNIT-III

IMAGE ENHANCEMENT AND RESTORATION: Point Operation, Histogram Modeling, Spatial Operations, Transform Operations, Multispectral Image Enhancement. Image Observation Models, Inverse and Wienerfiltering; FIR Wiener Filters, Filtering using Image Transform Causal Models and recursive filtering Maximum entropy restoration. Extrapolation of band limited signal.

UNIT-IV

IMAGE ANALYSIS AND IMAGE COMPRESSION: Spatial feature extraction, Edge detection and boundary extraction Boundary, region and moment representations structures, Texture, Image Segmentation,Reconstruction from Projections, Pixel Coding, Productive Techniques, Transform Coding Theory, Codingof Image, Coding of two-tone image.

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

1. Understand the need for image transforms different types of image transforms and theirproperties.
2. Develop any image processing application and understand the rapid advances in Machine vision.
3. Learn different techniques employed for the enhancement of images.
4. Learn different causes for image degradation and overview of image restoration techniques.
5. Understand the need for image compression and to learn the spatial and frequencydomain techniques of image compression.
6. Learn different feature extraction techniques for image analysis and recognition.

Text Books:

1. Anil Jain, Digital Image Processing, PHI.
2. Gonzalez and Woods, Image Processing, Addison Wesley & Sons.
3. Digital Image Enhancement, Restoration and Compression, 4th Edition, SE Umbaugh, Taylor&Francis/CRC Press, 2023
4. Yao wang, Joem Ostarmann and Ya – quin Zhang, "Video processing and communication", 1st edition, PHI

NETWORK SECURITY AND CRYPTOGRAPHY

Semester	VI				
Course code					
Category	Professional Elective Courses				
Course title	Network Security And Cryptography				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Classwork	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. To understand cryptography theories; algorithms & systems.
2. To understand the symmetric and asymmetric key algorithms.
3. To understand necessary approaches & techniques to build protection mechanisms in order to secure Computer Networks.
4. Acquire fundamental knowledge on the concepts of different security layers.

UNIT - I

Introduction: Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

UNIT - II

Symmetric Key Algorithms: Introduction, algorithms types and modes, DES, AES.

Asymmetric Key Algorithms: Introduction, history of asymmetric key cryptography, RSA symmetric and asymmetric key cryptography together, Digital signature.

UNIT - III

Internet Security Protocols: Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), S SL versus SET, Electronic Money, Email Security.

UNIT - IV

User Authentication And Kerberos: - Introduction, Authentication basics, Passwords, authentication tokens, certificate-based authentication, biometric-based authentication, Kerberos, key distribution center(KDC), Security handshake pitfalls, single Sign on(SSO) approach.

COURSE OUTCOMES:

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

CO1: Identify services that enhance the security and its mechanism.

CO2: Classify security attacks on information over network. Describe and apply classical encryption

techniques.

CO3: Explain and apply modern block cipher with modes

CO4: Compare conventional encryption algorithms & public key cryptography, and design Encryption algorithm to provide the Integration and confidentiality of a message.

CO5: Understand the concept of hash function with application and message authentication code in security system

CO6: Classify key management schemes and discuss web security and transport level security protocols.

TEXT AND REFERENCE BOOKS:

1. Cryptography and Network Security, 2nd Edition by Atul Kahate, TMH
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP, Stalling, Willian (AWL)
4. SNMP: A Guide to Network Management (MGH)
5. Telecom Network Management by H.H. Wang (MGH)
6. Network Management by U. Dlack (MGH)