

DEPARTMENT OF INFORMATION TECHNOLOGY  
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

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SCHEME & COURSES OF STUDY  
**FOR**  
BACHELOR OF TECHNOLOGY  
**IN**  
INFORMATION TECHNOLOGY

***DEPARTMENT OF INFORMATION TECHNOLOGY***  
***NATIONAL INSTITUTE OF TECHNOLOGY***  
***HAZRATBAL SRINAGAR, J&K-190006***

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***COURSE STRUCTURE BATCH 2007***

**Semester: 3<sup>rd</sup>**

S.No.	Course	Code	L	T	P	Credits
1.	Object Oriented Programming	IT 301	3	1	0	4
2.	Object Oriented Programming Lab	IT 302 P	0	0	2	1
3.	Colloquium	IT 303	0	2	0	2
4.	Electronic Circuits	ECE 301	3	1	0	4
5.	Electronic Circuits Lab	ECE 302 P	0	0	2	1
6.	Discrete Structures	Math 301	3	1	0	4
7.	Electric Circuit Analysis	ELE 301	3	1	0	4
8.	Electric Circuit Analysis -Lab	ELE 302 P	0	0	2	1
9.	Internet & Web Designing	IT 303	1	0	4	3
<b>Total</b>			13	06	10	<b>24</b>
			29			

**Semester: 4<sup>th</sup>**

S.No.	Course	Code	L	T	P	Credits
1.	Digital Electronics & Logic Design	ECE 401	3	1	0	4
2.	Digital Electronics & Logic Design Lab	ECE 402 P	0	0	2	1
3.	Data Structures	CSE 401	3	1	0	4
4.	Data Structures Lab	CSE 402 P	0	0	2	1
5.	Control Systems	ELE 401	3	0	0	3
6.	Communication Systems	ECE 408	3	1	0	4
7.	Communication Systems Lab	ECE 408 P	0	0	2	1
8.	Automation Tools	IT 401	1	0	2	2
9.	Introduction to Probability Theory & Random Processes	Math 403	3	1	0	4
<b>Total</b>			16	04	08	<b>24</b>
			28			

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***COURSE STRUCTURE BATCH 2007***

**Semester: 5<sup>th</sup>**

S.No.	Course	Code	L	T	P	Credits
1.	Database Management Systems	IT 501	3	1	0	4
2.	Database Management Systems	IT 502	0	0	2	1
3.	Computer Organisation & Architecture	CSE 501	3	1	0	4
4.	Microprocessor	ECE 501	3	1	0	4
5.	Microprocessor Lab	ECE 501 P	0	0	2	1
6.	Data Communication	ECE	3	1	0	4
7.	Design & Analysis of Algorithms	CSE 504	3	1	0	4
8.	Operating Systems	CSE 505	3	1	0	4
9.						
<b>Total</b>			18	06	04	<b>26</b>
			<b>28</b>			

**Semester: 6<sup>th</sup>**

S.No.	Course	Code	L	T	P	Credits
1.	Advanced Internet Technology	IT 601	3	0	0	3
2.	Advanced Internet Technology	IT 602 P	0	0	2	1
3.	Management Information Systems	IT 603	3	1	0	4
4.	Software Engineering	IT 604	3	1	0	4
5.	Elective-I	IT 604	3	1	0	4
6.	Computer & Communication Networks	IT 606	3	1	0	4
7.	Computer & Communication Networks Lab	IT 607 P	0	0	2	1
8.	Computer Graphics	CSE 606	3	1	0	4
9.	Computer graphics Lab	CSE 607 P	0	0	2	1
<b>Total</b>			18	05	06	<b>26</b>
			<b>29</b>			

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***COURSE STRUCTURE BATCH 2007***

**Semester: 7th**

S.No.	Course	Code	L	T	P	Credits
1.	Wireless & Mobile Communication	IT 701	3	1	0	4
2.	Wireless & Mobile Communication Lab	IT 702 P	0	0	2	1
3.	Information Security	IT 703	3	1	0	4
4.	Information Security Lab	IT 704 P	0	0	2	1
5.	Network Management	IT 705	3	1	0	4
6.	Elective-II	IT 706	3	1	0	4
7.	Elective -III	IT 707	3	1	0	4
8.	Seminar	IT 708	0	0	2	1
9.	Pre project	IT 709	0	0	6	3
<b>Total</b>			15	05	12	<b>26</b>
			32			

**Semester: 8<sup>th</sup>**

S.No.	Course	Code	L	T	P	Credits
1.	Project	IT 801	0	0	16	12
2.	Economics & Business Management	HSS	3	1	0	3
3.	Elective-IV	IT 802	3	1	0	4
4.	Elective-V	IT 803	3	1	0	4
5.	Practical Training	IT 804	0	0	2	1
<b>Total</b>			09	03	16	<b>24</b>
			28			

Batch 2007  
**List of Electives**

**Elective-I**

1. Image Processing
2. Operational Research
3. Information System Design
4. Artificial Intelligence

**Elective-II**

5. GIS
6. Telecom Switching Systems
7. Adhoc & Wireless Sensor Networks

**Elective-III**

8. Medical Informatics
9. Cryptography & Networks Security
10. DSP

**Elective-IV**

11. Multimedia Technologies
12. Distributive Computing
13. Grid Computing

**Elective-V**

14. Embedded systems & Architecture
15. Advanced java
16. Telemedicine

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Internet & Web Designing	IT 303	1	0	4	3

**Course Details**

The Internet: Classification of Networks, Networking Models, Packet Switching, Accessing the Internet, TCP/IP, IP Address, Intranet & Extranet, Internet Infrastructure, Protocols and Services on Internet, Domain Name System, SMTP and Electronic Mail, Http and World Wide Web, Usenet and Newsgroups, FTP, Telnet, Internet Tools, Search Engines, Web Browsers

**HTML:** Basic Tags of HTML, Formatting of Text, Working with Images, Multimedia, Links, Lists, Tables, Frames, Forms,

Introduction to DHTML, XML, SGML, Interactivity Tools, Front Page, Dream Weaver, JAVA Script, ASP, Java Applets

**JavaScript:** JavaScript Variables and Data Types, Object-Based Programming, Message box in JavaScript, JavaScript with HTML, Events, Event Handlers, Forms, Forms Array

**Multimedia and Graphics:** Music and sound for multimedia, Images and graphics, VRML and Authoring Tools for Graphic Web Editors, Animation.

**Internet Security management Concepts:** Overview of Internet Security, Firewalls, Internet Security, Management Concepts and Information Privacy and Copyright Issues, basics of asymmetric cryptosystems, Search Engine Optimization Techniques

**RECOMMENDED BOOKS**

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, TMH
2. B. Underdahle and K.Underdahle, "Internet and Web Page / WebSite Design", IDG Books India (P) Ltd.
3. D. Comer, "The Internet Book", Prentice Hall of India.
4. Dietel & Dietel "Internet & Web Designing"

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Electronics-I	ECE 303	3	1	0	4

Course Details

**Introduction to Semiconductors:** Intrinsic and extrinsic semiconductors transport mechanism of charge carriers, electric properties, Hall effect etc. Electronic Devices, their characteristics and applications.

**p-n junction diode:** Current components in p-n junction, characteristics-piece wise linear approximation, temperature dependence, Diode capacitance, and switching times, diode circuits half wave, full wave rectifiers, clipping circuits etc. Basic operations of Zener, avalanche, schottky photo and tunnel diodes.

**BJT'S :** Types operation and characteristics, Ebers-Moll model, CE, CB and CC configuration input, output characteristics and graphical analysis of basic amplifier circuits, Biasing and Bias stability, Low frequency, h-parameter model, Analysis and Design of transistor amplifier circuits using h parameters. High frequency hybrid – pi model, analysis and design of transistor amplifier circuits at high frequencies. Multistage amplifiers, phototransistors, Transistor as a switch, SCR's and Thyistors.

**FET'S:** Operation and characteristics, model Application at low and high frequency, amplifiers, switching circuits, MOSFEET TYPES, Operation and characteristics.

**Cathode Ray Oscilloscope:** Basic operation and measurement applications.

**TEXT BOOKS**

1. MuthuSubramaniam.R, "*Basic Electrical Engineering*"
2. Del Toro "Principles of Electrical Engineering "

**REFERENCE BOOKS**

1. Kothari D P and Nagrath I J , "*Basic Electrical Engineering*" , Tata McGraw Hill

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Electronics-I Lab	ECE 303 P	0	0	2	1

Course Details

1. Study of CRO - Measurement of Voltage frequency and Phase of a given waveform.
2. To assemble RC circuits and observe its performance in low pass and high pass mode.
3. To assemble a series and parallel resonant circuit and observe their frequency response.
4. To measure impedance and bandwidth of a parallel tuned circuit and obtain its quality factor.
5. To measure characteristic impedance of a symmetrical Tee and Pi networks.
6. To measure image impedance of a given asymmetrical Tee & Pi network.
7. For a given two port network measure.
  - i) ABCD parameters.
  - ii) h - parameters.
8. To experimentally determine the characteristic impedance and to plot the attenuation
  - i) characteristics of the following circuits.
  - ii) Prototype low pass filter.
  - ii) Prototype high pass filter.
9. To plot impedance and attenuation characteristics of following filters.
  - i) Prototype band-pass filter.
  - ii) m-derived LPF.
  - ii) m-derived HPF
10. To obtain diode characteristics
- 11
  - a) To assemble a half wave and a full wave rectifier and to study their performance.
  - b) To suppress the ripple using RC filter.
12. To obtain Zener diode characteristics and to use Zener diode as a voltage regulator
13. To assemble and observe the performance of clipping and clamping circuits.
  
14. To obtain transistor characteristics in the following configurations:
  - i) Common base.
  - ii) Common emitter
15. To assemble a CE amplifier and observe its performance.
16. To obtain JFET characteristics and to observe performance of a source follower.
17. To illustrate use of FET as a voltage variable resistor



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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Basic Electrical Engineering	ELE 301	3	1	0	4

**Course Details**

**Electric Circuit Laws:** Basic electric circuit terminology, Ohm's law, Kirchhoff's current law. (KCL) and Kirchhoff's voltage law (KVL) circuit parameters (Resistance, Inductance and capacitance). Series and Parallel combinations of resistance, Inductance and capacitance, Nodal analysis.

**Energy Source:** Ideal and practical voltage and current sources and their transformation.

**Dependent Sources:** Dependent voltage sources and dependent current sources.

**D.C. Circuit Analysis:** Power and energy relations, Analysis of series parallel d.c. circuits, Delta star (Y) Transformation, Loop and Nodal methods, Thevenin's, Norton's theorem, Maximum Power transfer theorem, Superposition theorem.

**A.C. Circuit Analysis:** Basic terminology and definitions, Phasor and complex number representations, solutions of sinusoidal excited, RC circuits, power and energy relations in a c circuits, Applications of network theorems to a.c. circuits, Resonance in series and parallel circuits.

**Steady State A.C. Three phase Circuits:** Concept of a 3 phase voltage, wye (Y - ) circuits. Delta circuits, current and voltage relations in Y and delta Circuits, characteristics of 3 phase systems.

**Magnetically Coupled Circuits :** Mutual inductance, Theory of magnetic circuits and electromagnetism. Transformers.

**TEXT BOOKS**

1. Thomas L. Floyd, *Electronic Devices*, Pearson Education
2. Albert Malvino, David J. Bates, *Electronic Principles*, Tata McGraw-Hill
3. Ramakant A. Gayakwad, *op-amps and Linear Integrated Circuits*, Prentice Hall of India

**REFERENCE BOOKS**

1. David A. Bell, *Electronic Devices and Circuits*, Prentice Hall of India,
2. Robert Boylestad, Louis Nashelsky, *Electron Devices and Circuit Theory*, Pearson Education
3. Jacob Millman, Christos C. Halkias, *Electronic Devices and Circuits*, Tata McGraw-Hill

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Basic Electrical Engineering Lab	ELE 302 P	0	0	2	1

**List of Experiments:**

1. To study the colour coding of resistors
2. Connection of Ammeters, Voltmeters, Watt meters and multi-meters in DC and AC circuits and selection of their ranges.
3. Use of LCRQ meter.
4. To study the series / parallel operation of resistors and verifying their effective values by LCRQ meter.
5. To verify the KVL and KCL in DC circuits.
6. To verify the star delta transformation of networks.
7. To verify the superposition theorem.
8. To verify the maximum power transfer theorem
9. Basic R, L, C circuits excited from A.C
10. To measure electric power in single-phase AC circuits with resistive load, RL load and RLC load.
11. To measure the power and power factor in three phase AC circuits.
12. To study the series resonance.
13. To study the parallel resonance.
14. To study the handling of CRO and use it for the study of different voltage waveforms.
15. Computer Aided Circuit Analysis (3 experiments)

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Object Oriented Programming	CSE 303	3	1	0	4

Course Details

<u>Introduction</u>	Basic features & concepts of Object Oriented Programming (OOP), Benefits, Languages and Applications of OOPs.
<u>Tokens, Expressions and Control Structures</u>	Tokens, Keywords, Identifiers & Constants, Basic Data types, User-defined Data types, Derived Data Types, Memory Management Operators, Manipulators, Expressions, Operator Overloading, Control Structures
<u>Functions in C++</u>	Main function, function prototyping, call by reference, inline functions, default functions, function overloading
<u>Classes and Objects</u>	Specifying a class, defining member functions, private member functions, array within a class, memory allocation for objects, arrays of objects, objects as function arguments, returning objects, pointers to members, local classes
<u>Constructors &amp; Destructors</u>	Constructors, Parameterized Constructors, Constructors with Default arguments, Dynamic Initialization of objects, Dynamic Constructors & Destructors
<u>Operator Overloading &amp; Type Conversion</u>	Definition & Rules of overloading Operators, Overloading Binary & Unary Operators
<u>Inheritance</u>	Definition, single, multilevel, multiple, hierarchical and hybrid inheritance, virtual base classes, abstract classes
<u>Pointers, Virtual Functions and Polymorphism</u>	Pointers, Pointers to Objects and derived classes, virtual functions, Pure virtual functions
<u>Templates</u>	Class templates, function templates, overloading of function templates, member function templates
<u>Strings</u>	Creating and manipulating string objects, accessing characters in strings, comparing and swapping

**Text Books :**

1. Object Oriented Programming with C++, **E Balagurusamy**
2. Object Oriented Programming in Turbo C++, **Robert Lafore**
3. Teach Yourself C++, **Al Stevens**
4. A Structured Approach using C++, **Farouzan & Gilberg**
5. Object Oriented Programming with C++, **R S Salaria**

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Systems & Signals	CSE 303	3	1	0	4

Course Details

**Introduction to signals:**

Classification of signals; Deterministic and non-deterministic, periodic and aperiodic, even and odd signals, energy and power signals, elementary signals; exponential, sinusoidal, impulse, step, ramp, pulse, square wave signals. Time shifting, time scaling and time-inversions of signals

**Linear Time invariant systems**

Continuous time system, basic system properties like causality, time invariance, stability, linearity, memory, order of system, interconnection of systems, Linear time invariant systems, characterization, unit impulse response, convolution, properties of LTI systems, linear constant co-efficient differential equations and system description.

**Fourier analysis of signals and systems**

Fourier series of periodic signals and its properties, Fourier transform of aperiodic signals and its properties, fourier transform of periodic signals, convolution in time and frequency domain, energy and signals, parsevals theorem, energy spectral density and its properties, Transfer function of LTI system

**The Laplace Transform**

Definition, relation between Laplace and Fourier transforms, region of convergence, properties of Laplace transform, initial and final value theorems, convolution, transfer function of LTI system, concept of poles and zeroes, stability criteria

**Random variable theory and random signals**

Probability, conditional probability, statistical independence, random variables, discrete and continuous random variables, probability distribution and probability density functions, statistical averages of random variables. Some important density functions.

**Random processes and characterization**

Ensemble and time averages, stationary and non-stationary random process, wide sense stationary random process, autocorrelation and cross-correlation functions, response of LTI systems to random inputs, noise and its types, white noise, signal to noise ratio of LTI systems.

**Books Recommended:**

- (1) Signals and Systems by Ziemann, Tranter, Fannin
- (2) Signals and Systems by Sanjay Sharma
- (3) Signals and Systems by A Populis
- (4) Random processes and Systems by A Populis
- (5) Signals and Systems by S. Hykin

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**Semester: 3<sup>rd</sup>**

Course	Code	L	T	P	Credits
Discrete Structures	MTH	3	1	0	4

Course Details

<u>Sets and Propositions</u>	Combinations of Sets, Finite and Infinite Sets, Unaccountably Infinite Sets, Mathematical Induction, Principle of Inclusion and Exclusion, Multisets, Propositions
<u>Computability and Formal Languages</u>	Ordered Sets, Languages, Phrase Structure Grammars, Types of Grammars and Languages
<u>Permutations, Combinations, and Discrete Probability</u>	The Rules of Sum and Product, Permutations, Combinations, Generation of Permutations and Combinations, Discrete Probability, Conditional Probability, Information and Mutual Information
<u>Relations and Functions</u>	A Relational Model for Data Bases, Properties of Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains and Antichains, A Job-Scheduling Problem, Functions and the Pigeonhole Principle
<u>Graphs and Planar Graph</u>	Basis Terminology, Multigraphs and Weighted Graphs, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, The Traveling Salesperson Problem
<u>Trees and Cut-Sets</u>	Trees, Rooted Trees, Path Lengths in Rooted Trees, Prefix Codes, Binary Search Trees, Spanning Trees and Cut-Sets, Minimum Spanning Trees
<u>Finite State Machines</u>	Finite State Machines, Finite State Machines as Models of Physical System, Equivalent Machines, Finite State Machines and Language Recognizers
<u>Discrete Numeric Functions and Generating Functions</u>	Manipulation of Numeric Functions, Asymptotic Behavior of Numeric Functions, Generating Functions, Combinatorial Problem
<u>Recurrence Relations and Recursive Algorithms</u>	Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Homogenous Solutions, Particular Solution
<u>Group and Rings</u>	Groups, Subgroups, Generators and Evaluation of Powers, Cosets and Lagrange's Theorem, Permutation Groups and Burnside's Theorem, Codes and Group Codes, Isomorphisms and Automorphisms, Homomorphisms and Normal Subgroups, Rings, Integral Domains, and Fields

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Boolean Algebras

Lattices and Algebraic Systems, Principle of Duality, Basic Properties of Algebraic System, Defined by Lattices, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebras, Uniqueness of Finite Boolean Algebras, Boolean Functions and Boolean Expressions, Propositional Calculus

**Textbooks:**

1. Elements of Discrete Mathematics by C.L. Liu Mc Graw Hill
2. Discrete Mathematical Structures by Kolman B, Busby R. C, Ross S.C by Pearson Education
3. Discrete Mathematical Structures: Theory & Applications by D.S Malik & M.K.Sen Thomson India Edition

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Software Engineering	IT 401	3	1	0	4

**INTRODUCTION**

Software Engineering Paradigms- Software Development Process Models- Project & Process- Project Management- Process & Project Metrics.

**PLANNING & SCHEDULING**

Software prototyping.

**Software project planning:** Scope- Resources- Software Estimation- Empirical Estimation Models. Planning- Risk Management- Software Project Scheduling.

**ANALYSIS & DESIGN**

Analysis Modelling- Data Modelling- Functional Modelling- Information Flow- Behavioural Modelling- Structured Analysis.

**Design Concepts & Principles:** Design Process- Design Concepts- Modular Design- Design Effective Modularity- Introduction to Software Architecture- Data Design- Transform Mapping- Transaction Mapping.

**IMPLEMENTATION & TESTING**

**Software Testing methods:** White Box-Basis Path-Control Structure-Black Box- Unit Testing. **Integration testing:** Top-Down- Bottom-Up Integration- Validation & System testing.

**MAINTENANCE**

Maintenance process- System documentation- program evolution dynamics- Maintenance costs- Maintainability measurement- Case Studies.

**TEXT BOOK**

1. Roger S. Pressman, *Software Engineering*, McGraw Hill

**REFERENCE BOOKS**

1. Ian Sommerville, *Software Engineering*, Addison Wesley
2. Fairley, *Software Engineering Concepts*, McGraw Hill

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Digital Electronics & Logic Design	ECE	3	1	0	4

Review of Binary, octal and hexadecimal number systems. Various types of codes.

**Boolean algebra and Boolean theorems:** Logic gates and implementation of Boolean functions with various types of logic gates. Circuit equivalence. Simplification techniques and minimization by map methods. Tabular method.

**Combination logic and arithmetic circuits:** Encoders and Decoders, Multiplexers and De multiplexers.

**Sequential circuits:** state diagrams and state tables, design and analysis of flip flops, registers, counters, Synchronous and Asynchronous operation of sequential circuits. Analog to Digital converter, Digital to Analog converter.

Latches and memory organizations. ROM's, EPROM's and RAM's Dynamic and Static.

Introduction to PLA's

IEEE notations.

**TEXT BOOKS**

1. Charles H. Roth- Jr., *Fundamentals of logic design*, Thomson Asia
2. M. Morris Mano, *Digital Logic and Computer Design*, Prentice Hall of India.



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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Digital Electronics & Logic Design Lab	ECE P	0	0	2	1

To verify the truth table of following logic gates:

- i) AND OR and NOT
  - ii) NAND, NOR, XOR and XNOR
- 2) To realize the above gates using discrete active and passive components.
  - 3) To implement XOR and XNOR using universal logic gates.
  - 4) To verify De Morgans law using logic gates.
  - 5) To implement certain Boolean expressions and check their equality.
  - 6) To design and realize:-
    - Half adder and verify its truth table.
    - Full adder and verify its truth table.
    - Half subtractor and verify its truth table
    - Full subtractor and verify its truth table.
  - 7) To design a multiplexer/ demultiplexer using two input NAND gates.
  - 8) To design a 4 bit binary to decimal converter.
  - 9) To design a modulo 10 counter.
    - Given a frequency  $f$  obtain the waveforms with frequencies  $f/2, f/5$  &  $f/10$ .
  - 10) Design and realize the following flip flops using logic gates.
    - RS flip flop
    - JK flip flop
    - D flip flop
    - T flip flop
  - 11) Use PLL as
    - Frequency multiplier.
    - Frequency demodulator.
  - 12) Mini project.

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Semester: 4<sup>th</sup>

Course	Code	L	T	P	Credits
Control Systems	ELE 407	3	0	0	3

**Introduction to linear Control System:** Control Systems, types of control systems, feedback and its effects, mathematical modeling of physical systems.

**System Representations:** Block diagrams, transfer functions, signal flow graphs, polar and Bode plot representation of loop gains of control systems.

**Time Domain Analysis of Control Systems:** Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response), P I D Controllers.

**Stability of Control Systems:** Stability characteristic equation, state transition matrix, stability of linear time invariant systems, Rough-Hurwitz Criterion, Nyquist criterion, Root locus plot, Bode diagrams.

**Frequency Domain Analysis of Control Systems:** Frequency domain characteristics second order systems relative stability, graphic methods of determining gain margin and phase margin, Nichols chart.

**Introduction to Modern Control Theory:** State Equations, State Transition Matrix, State transition equations, State Diagrams, concept of controllability and observability.

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Control Systems Lab	ELE 408 P	0	0	2	1

**List of Experiments:**

1. To study the performance of Relay control Combination of P,I and D control schemes in a typical thermal system.(oven)
2. To study the torque-speed characteristics of an AC servomotor.
3. To study the time response of a variety of simulated linear systems.
4. To study the role of feedback in a DC speed control system.
5. To study the role of feedback in a DC position control system.
6. To study the role of a combination of P,I and D control actions in a variety of simulated linear systems.
7. To study the computer simulation of a number of systems.
8. Use of MATLAB / SIMULINK /Control System tool boxes.

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Data Structures	CSE 401	3	1	0	4

**LINEAR DATA STRUCTURES:** Introduction- Performance Analysis- Asymptotic Notation- **Linear Data Structures:** Lists – array representation, linked representation- stacks- Queues.

**NON-LINEAR DATA STRUCTURES:** Basic concepts and terminology- **Binary trees:** implementation and tree traversal algorithms- Expression tree-Binary Search Trees- Balanced Search Trees.

**SORTING AND SEARCHING: Sorting:** Insertion Sort- Shell Sort- Heap Sort- Merge Sort-Quick Sort- **Searching Techniques:** Sequential and Binary search- **Hashing:** Hash Function- Open and Closed Hashing- rehashing- extendible hashing.

**GRAPH ALGORITHMS**

Definitions and representation of graphs- Undirected and Directed graphs- Shortest Path Algorithms- Network Flow Problems- Minimum Spanning Tree- **Graph Search Methods:** Breadth First-Depth First Search- Introduction to NP–Completeness.

**ALGORITHM DESIGN TECHNIQUES**

Greedy Method- Divide and Conquer- Dynamic Programming- Randomized Algorithms- Backtracking algorithms- Branch and Bound.

**TEXT BOOKS**

1. Sartaj Sahni, *Data Structures, Algorithms and Applications in C++*, second edition, University Press, 2005.
2. Mark Allen Weiss, *Data Structures and Problem Solving using C++*, The Benjamin Cummings/ Addison Wesley Publishing Company, 2002. ( Ch – 5, 9, 10)

**REFERENCE BOOKS**

1. Horowitz Ellis, Sahni Sartaj, Mehta Dinesh, *Fundamentals of Data Structures in C++*, 2nd Edition, 2000, Galgotia Publications.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, *Data Structures and Algorithms*, Addison Wesley, 1987
3. Brassard Bratley, *Fundamentals of Algorithms*, PHI, 1996.
4. Thomas A. Standish, *Data Structures, Algorithm and Software Principles in C*, Addison – Wesley Publishing Company, 1st Edition, 1995.

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Data Structures Lab	CSE 402 P	3	1	0	1

**Identification of different data structures for different problems like :**

- Arrays
- Queues
- Linked-Lists
- Stacks

**Performing the same using C programming.**

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Basic Communication Systems	ECE	3	1	0	4

**Special analysis of Signals:** Fourier series of repetitive signals, Fourier transform of non-repetitive signals, Amplitude spectrum of special signals viz., pulse train and pulse waveform.

**Modulation:** AM, DSB/SC, SSB, VSB, Angle modulation, NBFM, WBFM, Diode detector, Frequency discriminator, AM & FM, Transmitter.

**Demodulation:** AM and FM signals, Radio Receivers – AM & FM (Block diagram)

**Noise Analysis:** Performance of AM & FM Systems, in presence of noise Threshold in AM & FM, Demodulation, pre emphasis and De emphasis, in FM Systems.

**Digital Communication:** Sampling, Quantization, quantization noise, Coding, Pulse code Modulation; differential PCM, ADPCM, Relative advantages and dis-advantages. Delta modulation, PWM & PPM.

**Digital Modulation Techniques:** ESK,FSK, M-FSK, DPSK, GFSK Schemes.

**TEXT BOOKS**

1. George Kennedy, *Electronic Communication Systems*, Third edition, Tata McGraw Hill
2. Simon Haykins, *Communication Systems*, Fourth Edition, John Wiley and Sons, INC
3. Wayne Tomasi, *Electronic Communications Systems Fundamentals Through Advanced*, Pearson Education Asia

**REFERENCE BOOKS**

1. K. Sam Shanmugam, *Digital & Analog Communication Systems*, 2nd Edition, John Wiley & sons
2. Rodger E. Ziemer / William H. Tranter, *Principles of Communication*, Fifth Edition, John Wiley & Sons, Inc
3. Taub, Schilling, *Principles of Communication Systems*”, Tata McGraw- Hill Edition, second Edition

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Basic Communication Systems Lab	ECE409 P	0	0	2	1

- i) Generation and detection of amplitude modulated signals.
- ii) Generation and detection of frequency modulated signals.
- iii) To measure sensitivity, selectivity, and fidelity of a radio receiver.
- iv) To generate PAM and PDM signals using IC 555.
- v) To test a pulse code modulator.
- vi) To measure the noise figure of the following systems:-
  - A.M. System.
  - F.M. System.

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**Semester: 4<sup>th</sup>**

Course	Code	L	T	P	Credits
Probability & Statistics	MTH	3	1	0	4

Measures of Central tendency and Measures of Variations (Dispersions), Moments, Measures of skewness and kurtosis. Random experiment, sample space, Events, Classical statistical and Axiomatic Definitions of Probability. Statements and proof of theorems on addition and multiplication of probabilities. Simple problems. Baye's theorem on conditional probability. Random Variables, Derivation of formulae for mean, Variance and moments of random variables for discrete and continuous cases. Laws of expectation, Binomial, Poisson and normal Distributions, Beta and gamma Distribution, t-distribution, F-Distribution, Chi-square Distribution and their applications. Methods of least squares, fitting a straight line and parabola of Degree 'p'. Regression and correlation. Multiple and partial correlation.

**TEXT BOOKS**

1. Veerarajan T., *Probability, Statistics and Random Processes*, Tata McGraw Hill
2. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons

**REFERENCE BOOKS**

1. Trivedi K S, *Probability and Statistics with reliability, Queuing and Computer Science Applications*, Prentice Hall of India, New Delhi
2. Gross.D and Harris.C.M. , *Fundamentals of Queuing theory*, John Wiley and Sons
3. Allen.A.O., *Probability Statistics and Queuing theory*, Academic Press



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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Database Management Systems	IT 502	3	1	0	4

**INTRODUCTION:** File Processing System- Advantages of DBMS over File Processing System- Data-Database- DBMS- Data model- Data Independence- Data Catalog- DBMS Architecture & Data Abstraction- DBMS Languages- DBMS System Structure- ER Model: Objects, Attributes and its Type, Entity and Entity Set, Relationship & Relationship Set

**DATABASE DESIGN:** Design Issues in choosing attributes or entity set or relationship set- Constraints- Super Key- Candidate Keys-Primary Key- ER Diagram Notations- Goals of ER Diagram- Weak Entity Set- ER Diagram Construction-Tabular Representation of Various ER Schema- Overview of Query Processing- Relational Algebra –Fundamental operations- Views

**STRUCTURED QUERY LANGUAGE:** SQL: Overview, The Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT- Nested Queries-Aggregate Functions- Null Values- Complex Integrity Constraints in SQL- Embedded SQL- Integrity Constraints- Object Oriented Database- Object Relational Database

**RELATIONAL MODEL DESIGN TECHNIQUE:** Pitfalls in relational database- Decomposing bad schema- Need for Decomposition- Desirable Properties of Decomposition- 1NF- Super Key & Functional dependency: Closure of Functional Dependency Set- Closure of Attribute Set- Minimal Functional Dependency Set- 2NF- BCNF- 3 NF- Denormalization- Practical Database Design & Alternative Design techniques

**PHYSICAL IMPLEMENTATION, TRANSACTION & RECOVERY:**File Structure: Overview of Physical Storage Media, Magnetic Disks, RAID- Transactions-Concurrency Control: Lock-Based Protocols- Recovery System- Introduction to Parallel & Distributed Database

**TEXT BOOK**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, *Database System Concepts*, McGraw-Hill
2. C. J. Date, "An introduction to database systems" Pearson Education

**REFERENCE BOOKS**

1. Raghu Ramakrishnan, Johannes Gehrke, *Database Management System*, McGraw Hill.
2. Elmashri & Navathe, *Fundamentals of Database System*, Addison-Wesley Publishing,
3. Date C.J, *An Introduction to Database*, Addison-Wesley Pub Co
4. Jeffrey D. Ullman, Jennifer Widom, *A First Course in Database System*, Prentice Hall, AWL
5. Peter rob, Carlos Coronel, *Database Systems – Design, Implementation, and Management*, Thomson Learning

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Database Management Systems Lab	IT 503	0	0	2	1

**LIST OF EXERCISES**

1. Simple Queries
2. Built-in-functions
3. Group Functions
4. Multiple sub-queries
5. SQL Views & Triggers
6. Simple PL/SQL Procedures
7. PL/SQL Procedures accessing Databases
8. Payroll System
9. Students Information System

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Microprocessor	ECE 501	3	1	0	4

**Microcomputer Structure and Operations:** Basic Microcomputer Elements, Typical Microcomputer Structure, CPU, Memory System, Input Output

**Microprocessors and Memory:** Typical 8, 16 and 32 bit Microprocessors, 8085 Microprocessor, Specification, Memory Technologies

**Assembly Language Programming I:** Programming Model of 8085, Registers Fetch, Execute, operation of CPU, Instruction Set

**Assembly Language Programming II:** Addressing Modes, Basic Operations, Microprocessor Arithmetic, Program Flow Control Using Looping and Branching

**Assembly Language Programming III:** Stack, Subroutines, Interrupts, Resets

**Bus System I:** System Bus Structure, Bus Operations, Cycle by Cycle Operations, Timing and Control, Priority Management, Address Decoding

**Microprocessors Interfacing I:** Interfacing concepts, Parallel Input Output, Memory Interfacing, Direct Memory Access

**Microprocessors Interfacing II:** The Serial Subsystems

**Microprocessor Interfacing III:** Programmable, Peripheral Interface, Analog Converter, Subsystem

**Micro controller:** 8051, 68HC11

**Application Examples:** Process Control, Robotics, CAI, Medical Physics

**Latest Developments in Microprocessor Technology**

**TEXT BOOK**

1 Ramesh S. Goankar, *Microprocessor 8085*

**REFERENCE BOOKS**

1. Douglas .V Hall, *Microprocessor & Interfacing*, Tata McGraw Hill
2. Rafiqzuman .M, *Microprocessor theory & Applications*, Prentice Hall of India
3. Yuchenhiu, Glenn A Gibson, *Microprocessor Systems - 8086/8088 Family*, Prentice Hall of India

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Microprocessor Lab	ECE 501P	0	0	2	1

Experiments

- i) To develop a program to add two double byte numbers.
- ii) To develop a subroutine to add two floating point quantities.
- iii) To develop program to multiply two single byte unsigned numbers, giving a 16 bit product.
- iv) To develop subroutine which will multiply two positive floating points numbers?
- v) To write program to evaluate  $P * Q * +R * & S$  are 8 bit binary numbers.
- vi) To write a program to divide a 4 byte number by another 4 byte number.
- vii) To write a program to divide an 8 bit number by another 8 bit number upto a fractional quotient of 16 bit.
- viii) Write a program for adding first N natural numbers and store the results in memory location X.
- ix) Write a program which decrements a hex number stored in register C. The Program should half when the program register reads zero.
- x) Write a program to introduce a time delay of 100 ms using this program as a subroutine display numbers from 01H to 0AH with the above calculated time delay between every two numbers.
- xi) N hex numbers are stored at consecutive memory locations starting from X. Find the largest number and store it at location Y.
- xii) Interface a display circuit with the microprocessor either directly with the bus or by using I/O ports. Write a programme by which the data stored in a RAM table is displayed.
- xiii) To design and interface a circuit to read data from an A/D converter, using the 8255 A in the memory mapped I/O.
- xiv) To design and interface a circuit to convert digital data into analog signal using the 8255 A in the memory mapped I/O.
- xv) To interface a keyboard with the microprocessor using 8279 chip and transfer the output to the printer.
- xvi) To design a circuit to interface a memory chip with microprocessor with given memory map.

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Digital Data Communication Fundamentals	IT 504	3	1	0	4

Introduction to digital communication systems, information and channel capacity, Entropy, Discrete and Continuous channels, Fano and Huffman's coding

Baseband data transmission systems, Error probability, ISI, pulse shaping, matched filters, M-ary signalling schemes, Equalization. Symbol synchronization.

Digital modulation schemes, ASK, PSK, FSK and QAM systems, Probability of error in digital modulation schemes, continuous phase carrier modulation, Modems

Digital transmission, Fading on multipath channels, Performance comparison of various digital modulation schemes

Error control coding, Hamming distance, Linear block codes, Cyclic codes, Convolution codes, Code generation and detection methods, Viterbi coding and decoding practical applications of coding. Waveform coding

Adaptive Delta-modulation, Speech coding, Linear predictive coding, Subband coding Adaptive transform coding, Digital audio transmission and Digital Audio recording

Introduction to spread spectrum communication systems direct sequence spread spectrum communication systems, frequency hopped spread spectrum systems, Other types of spread spectrum signals

**Text & Reference Books:**

1. Digital & Analog Communication Systems - K.S. Shammugham
2. Digital Communication - J.G. Proakis
3. Digital Communication - Simon Haykin
4. Principles of Digital Communication - P. Chakravarti
5. Wireless Digital Communication - Kamilo Feher
6. Digital Communication System Design - M.S. Roden

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Data Communication	ECE	3	1	0	4

**Data Transmission:** Data encoding, digital data communication technique, protocol, interface standard. Error detecting and error correcting technique, nature of transmission errors, error detecting codes, error correcting codes, retransmission techniques.

**Multiplexing and de-multiplexing techniques :** TDM, FDM.

Introduction to transmission media and network topologies, MAN, LAN, WAN.

Synchronous and asynchronous networks, carriers, bit and frame synchronization.

Circuit switching, message switching and packet switching, relative advantages and disadvantages. Routing techniques, flooding static routing, centralized routing, distributed routing.

**Multiple access scheme:** TDMA, FDMA, ALOHA, CSMA techniques.

Integrated services, digital network, broadband ISDN.

Text Books

1. Digital & Analog Communication Systems - K.S. Shammugham
2. Digital Communication - J.G. Proakis
3. Digital Communication - Simon Haykin
4. Principles of Digital Communication - P. Chakravarti
5. Wireless Digital Communication - Kamilo Feher
6. Digital Communication System Design - M.S. Roden

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Design and Analysis of Algorithms	CSE 504	3	1	0	4

**Course Details:**

Introduction: Algorithm Design paradigms- motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptomatic Notations.

Divide & Conquer: Structure of divide and conquer algorithms: examples, Binary search, Quick sort, analysis of divide and conquer run time reference relations.

Greedy method: Overview of the greedy paradigm, examples of exact optimization solution (minimum cost spanning tree), approximate solution (Knapsack problem), single source shortest paths.

Dynamic Programming: Overview, difference between dynamic programming and divide and conquer, applications: shortest path in graph, matrix multiplication, travelling salesman problem, longest common sequence.

Graph searching and traversal: Overview, traversal methods, depth first and breadth first search.

Back Tracking: Overview, 8-queen problem and Knapsack problem.

Branch & Bound: LC searching, bounding, FIFO branch and bound, Applications: 0/1 Knapsack problem, Travelling salesman problem.

Computational complexity: Complexity measures, Polynomial vs non-polynomial time complexity; NP hard and NP complete classes, examples

**Books Recommended:**

**Text Books:**

☞☞ Thomas H. Cormen et.al. "Introduction to Algorithms", Prentice Hall of India.

☞☞ Design & Analysis of Computer Algorithms by Aho, Pearson education. Horowitz, Sahani, Rajsekharan,

☞☞ "Computer Algorithms", Galgotia Publications Pvt. Ltd. Brassard, Bratley, "Fundamentals of Algorithms", Prentice Hall

**Reference Books:**

☞☞ Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase & A. V. Gelder Pearson Education.

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**Semester: 5<sup>th</sup>**

Course	Code	L	T	P	Credits
Operating Systems	CSE 505	3	1	0	4

**Introduction:** Operating system and function, Evolution of operating system, Batch, Interactive, Time Sharing and Real Time System, System protection.

**Operating System Structure:** System Components, System structure, Operating System Services.

**Concurrent Processes:** Process concept, Principle of Concurrency, Producer Consumer Problem, Critical Section problem, Semaphores, Classical problems in Concurrency, Inter Process Communication, Process Generation, Process Scheduling.

**CPU Scheduling:** Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling.

**Deadlock:** System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock combined approach.

**Memory Management:** Base machine, Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Paged replaced algorithm, Allocation of frames, Thrashing, Cache memory, Organization, Impact on performance.

**I/O Management & Disk Scheduling:** I/O devices and organization of I/O function, I/O Buffering, DISK I/O, Operating System Design Issues.

**File System:** File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues.

**Books and References:**

- 1 J. Peterson, A. Silberschatz, and P. Galvin. *Operating System Concepts*, Addison Wesley
- 2 M. J. Bach. *Design of the Unix Operating System*, Prentice Hall of India.
- 3 A. Silberschatz and P. Galvin. *Operating System Concepts*, Addison Wesley



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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Advanced Internet Technology	IT 601	3	0	0	3

**Introduction:** Web Server administration, Client Sever implementation, Cyber law, Search Engine Optimization Techniques, Web Based Systems

**Design and development of Web Services,** XML Web Services: Introduction to Web Services- Building an XML Web Service - Building an XML Web Service Client - Understanding WSDL and SOAP - Using Web Services with Complex Data Types.

**.NET AND C# FUNDAMENTALS**

Introduction to .NET and C#: Overview of the .NET Framework - Common Language Runtime – Framework Class Library - Understanding the C# Compiler. Basics of C#: Working with Variables - Making Decisions. Classes and Objects: Methods – Properties - Interface- Partial class- Null and Casting Handling Exceptions.

**WINDOWS APPLICATIONS**

Windows and Dialogs: MDI – Dialogs. Lists: List Box - Tree view control - Menus and Toolbars – Delegates and Events Generics.

**DATA ACCESS WITH .NET**

Data Access With .Net: ADO.NET overview - Commands - Data Reader - XML Schemas - Populating a dataset. .Net Programming with SQL Server: Reading and writing streamed Xml - converting ADO.Net to Xml data.

**PROGRAMMING FOR THE INTERNET**

ASP.NET Web Forms and Controls: Web Forms Controls - Data Binding and Data Source Controls - Validation

Controls - Master and Content pages. The Asp.Net Application Environment: Configuration Files - ASP.NET

Application Security - Caching.

**TEXT BOOKS**

1. Stephen C. Perry, *Core C# and .NET*, Prentice Hall, New Jersey, 2005 (Chapters 1, 16 - 18)
2. Peter Wright, *Beginning Visual C# 2005 Express Edition: From Novice to Professional*, Apress, 2006

**REFERNECE BOOKS:**

1. John Sharp, *Microsoft Visual C#.NET – Step by Step*, Microsoft press
2. Dietel et al., *Visual C# 2005 How to program*, Prentice Hall Inc
3. Fritz Onion, Keith Brown, *Essential ASP.NET 2.0*, Addison Wesley

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Advanced Internet Technology Lab	IT 602 P	0	0	2	1

**LIST OF EXERCISES:**

- 1. Installation and configuration of a web server**
- 2. Design and implementation of web Services**
3. Implementing OOPs features
4. Implementation of Properties, Interface and Partial class
5. Exception Handling
6. Designing a Notepad Editor using MDI
7. Demonstration of Delegates and Events Generics
8. Implementation of ADO.NET for retrieval of data from windows and console application
9. Writing stored procedures for inserting, updating and selecting data.
- 10. Design a simple webpage using ASP.NET**

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Management Information Systems	IT 603	3	1	0	4

**MANAGING THE DIGITAL FIRM**

Why information systems – contemporary approaches to information systems – new role of information systems- major types of systems in organizations – systems from a functional perspective – enterprise applications – organizations and information systems – managers decision making and information systems

– information systems and business strategy.

**UNIT II DESIGNING INFORMATION SYSTEMS**

Systems as planned organizational change – business process re-engineering and process improvement –

overview of systems development – alternate system – Building approaches – Understanding the business

value of Information Systems - The importance of change management in information system success and

failure – Managing Implementation.

**UNIT III DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS 9**

Systems analysis and design – System development life cycle – Limitation – End User Development – Managing End Users – off-the shelf software packages – Outsourcing – Comparison of different methodologies.

**UNIT IV KNOWLEDGE MANAGEMENT, ETHICS AND SECURITY 9**

Knowledge Management in the organization – Information and Knowledge base systems – Decision - support systems – Understanding ethical and Social issues packed to systems – Ethics in an Information society – The moral dimensions of Information Systems – System vulnerability and abuse – Creating a control environment – Ensuring System Quality.

**UNIT V INFORMATION ARCHITECTURE 9**

Defining Information Architecture – why Information Architecture matters – Practicing Information Architecture in the Real world – Information Ecologies – User needs and Behavior – The anatomy of Information Architecture – Organizing Systems – Search Systems.

**TOTAL : 45**

**TEXT BOOKS**

1. Lauaon Kenneth & Landon Jane, "Management Information Systems: Managing the Digital firm", Eighth edition, PHI, 2004.[Unit – 1, 2, 4]
2. Uma G. Gupta, "Management Information Systems – A Management Prespective", Galgotia publications Pvt., Ltd., 1998. [Unit – 3].
3. Louis Rosenfel and Peter Morville, "Information Architecture for the World wide Web", O'Reilly Associates, 2002. [Unit – 5].

**REFERENCES**

1. Steven Alter, "Information Systems – A Management Perspective", Pearson Education, 2001.
2. Uma Gupta, "Information Systems – Success in 21st Century", Prentice Hall of India, 2000.
3. Robert G. Murdick, Joel E. Ross and James R. Claggett, "Information Systems for Modern Management", PHI, 1994.

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Information Theory & Coding	IT 604	3	1	0	4

**Source Coding:** Introduction to information theory, uncertainty of information, Information measure, entropy, source coding Theorem, Huffman Coding, runlength encoding, rate distortion function, JPEG and MPEG standards in image compression.

**Channel Capacity and Coding:** Channel models, Channel Capacity, Channel Coding, Information Capacity Theorem, The Shannon Limit.

**Error Control Coding:** Linear Block Codes: Introduction, Basic Definition, Equivalent codes, parity – check matrix, decoding, syndrome decoding, Perfect Codes, Hamming Codes, Optimal Linear codes.

**Cyclic Codes:** Introduction polynomials, The division Algorithm, Method for generating cyclic codes, Burst Error correction, Fire Codes, Golay Codes, CRC Codes, Circuit implementation.

**Bose Chaudhuri Hocquenghem (BCH):** Introduction, Primitive elements, minimum polynomial, Examples of BCH codes, Decoding of BCH codes, Reccd – Solomon codes.

**Convolution Codes:** Introduction, Tree Codes and Trellis Codes, Polynomial description, The Generating Function, Matrix Description, Viterbi Decoding, Distance bounds, Turbo Codes, Turbo Decoding.

**Trellis Coded Modulation (TCM):** Introduction, the concept of coded modulation, Mapping by set Partitioning, Design rules, TCM Decoder.

**Coding for Secure Communication, Cryptography:** Introduction, encryption techniques, Symmetric cryptography, data encryption standard, Asymmetric Algorithm the RSA Algorithm.

**Text Books:**

1. Information Theory, Coding and Cryptography by Ranjan Bose, TMH Publication, 2003.
2. Principle of Communication Systems, TMH Publication.
3. Digital Communication, J. G. Proakis, McGraw Hill Publication, 3rd Edition.

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Elective-I	IT 605	3	1	0	4

**Introduction** :What is digital image processing? The origins of digital image processing. Fundamental steps in digital image processing ,components of an image processing system.

**Digital image fundamentals**: Image sampling and quantisation, basic relationships between pixels, linear and non-linear operations.

**Image enhancement in the Spatial Domain**: Gray level transformations, histogram processing, enhancement using arithmetic/logic operations, spatial filtering-smoothing and sharpening.

**Image enhancement in Frequency Domain**: Fourier transform and frequency domain, smoothing and sharpening frequency domain filters

**Colour image processing**: Fundamentals, models, colour transformations, smoothing and sharpening, colour segmentation and noise.

**Image Segmentation**: Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation, morphological watersheds.

**Representation and description**: Representation, boundary descriptors, regional descriptors, relational descriptors.

#### TEXT BOOKS

Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education

#### REFERENCES

1. William K Pratt, Digital Image Processing John Willey
2. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy
3. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
4. Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India,

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Computer & Communication Networks	CSE 603	3	1	0	4

Introduction to computer networks: network operating system. Network hardware: LAN, WAN – Network software - Reference Models: OSI Reference model, TCP/IP Reference model- network topologies.

**DATA LINK AND SWITCHING THEORY:** Switching Theory: Circuit Switching, Packet switching - Guided Transmission Media- encoding. Design Issues  
: Framing, Error control services, Flow Control- Sliding window protocol- HDLC.

**MAC LAYER AND STANDARDS**

Multiple Access Protocols: Carrier sense multiple access protocol, Collision free protocols- Ethernet: IEEE 802.3, IEEE 802.4 token bus , IEEE 802.2 Logical link control, Fast Ethernet- HUB- Bridge- FDDI.

**NETWORK DESIGN ISSUES**

Design Issues: Service provided to the transport layer, comparison of virtual circuits and datagrams. Routing algorithms: Subnets, shortest path routing, flooding, Distance vector routing - congestion control: jitter control, load shedding. Routing and Traffic Control Chapter 12 & 13  
Dijkstra, Bellman-Ford Algorithms

**TRANSPORT LAYER AND APPLICATIONS**

Service: Service provided to the upper layer. Elements: Flow control and buffering, multiplexing-transport protocol as a finite machine- TCP protocol header- congestion control- UDP- Email- WWW. Link State vs Distance Vector Methods, Flow and Congestion Control  
Layer 2 Switches & Bridges, Spanning Tree Algorithm Virtual LANs  
Internetworking  
Routers and Gateways  
Internet IP  
Network Applications

**TEXT BOOKS**

1. Andrew S. Tanenbaum, *Computer Networks*, Fourth Edition, Prentice Hall of India, 2003.

**REFERENCE BOOKS**

1. Douglas E. Comer, "*Computer Networks & Internet* ", Pearson Education Asia , 2nd Edition ,2001
2. Fred Halsall , *Data Communication, Computer Networks & Open System*, Addison Wesley, 2000.
3. William Stallings, *Data and Computer Communications*, Fourth Edition, Prentice Hall of India, 2004.

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Computer & Communication Networks Lab	CSE 604 P	0	0	2	1

1. Designing of different topologies for a LAN
2. Simulation of ARP / RARP.
3. Write a program that takes a binary file as input and performs bit stuffing and CRC Computation.
4. Develop an application for transferring files over RS232.
5. Simulation of Sliding-Window protocol.
6. Simulation of BGP / OSPF routing protocol.
7. Develop a Client – Server application for chat.
8. Develop a Client that contacts a given DNS Server to resolve a given host name.
9. Write a Client to download a file from a HTTP Server.
10. Study of NS2.
11. Study of Glomosim / OPNET.

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**Semester: 6<sup>th</sup>**

Course	Code	L	T	P	Credits
Computer Graphics	CSE 606	3	1	0	4

**Introduction:** Co-ordinate representation, Pixel, Raster Scan & Random Scan methods, color CRT Raster scan basics, video basics, interactive devices, graphics input and output devices, mouse, track ball, light pen, digitizer, thumb wheel, raster scan graphics.

**Graphics Primitives:**

Introduction to Picture Synthesis and Analysis. Conceptual Framework of an Interactive Graphical Simulation System. Graphics hardware. Basic Raster Graphics Algorithms.

Introduction to Simple Raster Graphics Package (SRGP). Graphics Entities. Geometric Transformations. Object hierarchy. Segmentation. Interaction Techniques.

Geometric Modeling in 3-D. Viewing in 3-D. Concept of Synthetic Camera. Dialogue Design. Graphics User Interfaces. Windowing Systems.

Graphical Modeling of Discrete events. Simulation of Discrete Event Displays. Animation Techniques. Basic Rules for Animation. Graphical Simulation of continuous motion.

Role of Virtual Reality in Graphical Simulation.

**Books and References:**

1. Newman & Sproul, Principles of Interactive Computer Graphics.
2. James D. Foley, Andries VanDam, Steven K. and John F. Hughes. *Computer Graphics: Principle and Practice*, Addison-Wesley Publishing House.
3. Foley and VanDam. *Fundamentals of Interactive Computer Graphics*, Addison-Wesley.
4. Rogers D. F. *Procedural Elements of Computer Graphics*, McGraw Hill.
5. Dennis Harris. *Computer Graphics and Applications*, Hearn and Baker.
6. *Computer Graphics*, Prentice Hall of India.



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**Semester: 6<sup>th</sup>**

<b>Course</b>	<b>Code</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
<b>Computer Graphics Lab</b>	<b>CSE 607 P</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

1. To implement Bresenham's algorithms for line, circle and ellipse drawing
2. To perform 2D Transformations such as translation, rotation, scaling, reflection and shearing.
3. To implement Cohen-Sutherland 2D clipping and window-viewport mapping
4. To perform 3D Transformations such as translation, rotation and scaling.
5. To visualize projections of 3D images.
6. To convert between color models.
7. To implement text compression algorithm
8. To implement image compression algorithm
9. To perform animation using any Animation software
10. To perform basic operations on image using any image editing software

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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Wireless & Mobile Communication	IT 701	3	1	0	4

Evolution Of Mobile Radio Communications- Introduction- Frequency Reuse- Channel Assignment Strategies-Handoff Strategies- Interference And System Capacity- Trunking And Grade Of Service- Improving Capacity In Cellular Systems.

**MULTIPLE ACCESS TECHNIQUES AND WIRELESS NETWORKING:** Introduction- FDMA- TDMA- Spread Spectrum- Multiple Access: Space Division Multiple Access- Packet RadiolT– 07-08-52 SRM – E&T Introduction To Wireless Networks- Differences Between Wireless And Fixed Telephone Networks- Development Of Wireless Networks- Traffic Routing In Wireless Networks- Integrated Services Digital Network (ISDN)- Protocols For Network Access

**WIRELESS SYSTEMS AND STANDARDS:** Global System for Mobile communication - CDMA Digital Cellular Standard (IS-95) - CT2 Standard for Cordless Telephones- Digital European Cordless Telephones (DECT). Mobile communication: Mobile data management in 1G,2G,3G, Frequency reuse, sectoring, GSM and CDMA architecture, EDGE technology, Mobile IP, Mobile Agents

**MOBILE AND WIRELESS SECURITY:** Security Primer- Creating A Secure Environment- Threads- Technologies- Other Security Measures- WAP Security Measures- Smart Client Security- Overview of Smart Client Architecture- Mobile Operating Systems.

**TEXT BOOKS:**

1. Theodore.S.Rappaport, *Wireless Communications-Principles and practice*, Prentice Hall Communications Engineering and Emerging Technologies Series, Upper Saddle River, New Jersey
2. Martyn Mallick, *Mobile and Wireless Design Essentials*, Wiley Dreamtech India pvt ltd.
3. Geoff Varall, Roger Belcher, *3G Handset & Network Design*, Wiley Dreamtech India pvt ltd.

**REFERENCES:**

1. Jochen Schiller, *Mobile Communications*, Addison Wesley
2. William C.Y.Lee, *Mobile Communication Design Fundamentals*, John Wiley

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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Information Security	IT 702	3	1	0	4

History, What is Information Security ?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC, Primer on Networking-Active vs. Passive attacks-Layers and Cryptography-Authorization-Key escrows- Multilevel model of security-Legal issues.

**IPSECURITY:** Overview of IPsec - IP and IPv6-Authentication Header-Encapsulation Security Payload(ESP)-Internet Key Exchange SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL-Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET)

**SYSTEM SECURITY:** Firewall Design Principles- Packet Filters- Application level Gateways-Tunnels-DoS attacks-Intrusion Detection-Password Management-Malicious Software.

**SECURITY ANALYSIS:** Risk Management : Identifying and Assessing Risk, Assessing and Controlling Risk Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

**UNIT V PHYSICAL DESIGN:** Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

**TEXT BOOK**

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi

**REFERENCES**

1. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", CRC Press LLC
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, Matt Bishop, " Computer Security Art and Science", Pearson/PHI

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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Network Management	IT 704	3	1	0	4

**Introduction:** Lan Administration, Monitoring file use, virus scanning, printer & Storage Management, Tracking network activity

**LAN Restoration Planning:** Network Reliability and Availability, Recovery Options, server Restoration, data protection, Load Balancing

**Storage Network Management:** SAN, SAN Management, Role of IP, Storage virtualization

**Managing Bridges Routers and gateways**

**Managing Wireless infrastructure:** Mobile IP, Performance Monitoring, setting SNMP Traps

**Managing Voice Systems:** Centralised Vs. distributed, Virtual networks, VPN architecture

**Network Management systems:** Management system evolution, Management in wired world, mechanics of SNMP, Graphical SNMP tools, SNMP on wireless networks, telecommunication management network  
Managing service quality, network security

Network planning and designing tools.

**Text books:**

1. Nathan J. Muller, "LANs to WANs the complete management guide"
2. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Addison Wesley,

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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Elective-II	IT 705	3	1	0	4

**Artificial Intelligence**

**Introduction :** Introduction to Artificial Intelligence, Simulation of sophisticated & Intelligent Behaviour in different area, problem solving in games, natural language, automated reasoning, visual perception, heuristic algorithm versus solution guaranteed algorithms.

**Understanding Natural Languages:** *Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Fillmore's grammars, Shanks Conceptual Dependency, grammar free analyzers, sentence generation, and translation.*

**Knowledge Representation:** *First order predicate calculus, Horn Clauses, Introduction to PROLOG, Semantic Nets Partitioned Nets, Minsky frames, Case Grammar Theory, Production Rules Knowledge Base, The Interface System, Forward & Backward Deduction.*

**Expert System:** Existing Systems (DENDRAL, MYCIN), domain exploration, Meta Knowledge, Expertise Transfer, Self Explaining System.

**Pattern Recognition:** Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Line Finding, Interception, Semantic & Model, Object Identification, Speech Recognition.

**Programming Language:** Introduction to programming Language, LISP, PROLOG

**Text Books &References :**

1. Char nick "Introduction to Artificial Intelligence", Addison Wesley.
2. Rich & Knight, "Artificial Intelligence".
3. Winston, "LISP", Addison Wesley.
4. Marcellous, "Expert Systems Programming", PHI.
5. Elamie, "artificial Intelligence", Academic Press.
6. Lioyed, "Foundation of Logic Programming", Springer Verlag.

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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Elective -III	IT 706	3	1	0	4

**Digital Signal Processing**

**SIGNALS AND SYSTEMS :** Basic elements of digital signal Processing –Concept of frequency in continuous time and discrete time signals – Sampling theorem – Discrete time signals. Discrete time systems – Analysis of Linear time invariant systems –Z transform – Convolution and correlation.

**FAST FOURIER TRANSFORMS:** 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 IIR FILTER DESIGN:** 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.

**UNIT IV FIR FILTER DESIGN:** Symmetric & Antisymmetric FIR filters – Linear phase filter – Windowing technique – Rectangular, Kaiser windows – Frequency sampling techniques – Structure for FIR systems.

**UNIT V FINITE WORD LENGTH EFFECTS :** Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error -limit cycle oscillation – signal scaling – analytical model of sample and hold operations – Application of DSP – Model of Speech Wave Form – Vocoder.

**TEXT BOOK**

1. John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education

**REFERENCES**

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education
2. Johnny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education
3. Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill,

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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Industrial Organization & Management	HSS	3	0	0	3

**Introduction:** Industry, meaning of Industrialization, Industrial revolution, Need problems and prospects of Industrial change in the developing countries.

**Industrial Evolution in India:** Downfall of early industries, evolution of modern industry, effects of partition, industrial policy and progress after independence.

**Forms of Industrial Organization:** Single Proprietorship, Partnership, Joint Stock companies, Cooperatives and State Enterprises.

**Growth of Industry and Management:** Meaning of industrial management, functions and tools of management, growth of management concepts.

**Objectives of Industrial Management:** Defining management objectives, managerial activity and objectives, tests of management of objectives, primary, secondary personal and social objectives of management.

**Management Organization:** Various forms of organization of departmentalization line staff, functional and committee organization, formal and non formal organization. Management and Authority, Decision Making in Management, Leadership, Definition, Traits, inborn traits, acquired traits, analytical etc., Marketing of Industrial Products and the Sales Manager.

**Personal Management:** Recent changes in personal management function of personal departments, sections, training and placement other functions of personal department.

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**Semester: 8<sup>th</sup>**

Course	Code	L	T	P	Credits
Elective-IV	IT 802	3	1	0	4

**Adhoc & Wireless Sensor Networks**

**AD HOC NETWORKS:** Characteristics and Applications of Ad hoc Networks, Routing – Need for routing and routing, classifications, Table Driven Routing Protocols, Source Initiated On-Demand Routing Protocols, Hybrid, Protocols – Zone Routing, Fisheye Routing, LANMAR for MANET with group mobility, Location Added Routing, Distance Routing Effects, Microdiscovery and Power Aware Routing

**Wireless SENSOR NETWORKS:** Wireless Sensor Networks, DARPA Efforts, Classification, Fundamentals of MAC, Flat routing – Directed Diffusion, SPIN, COGUR, Hierarchical Routing, Cluster base routing, Scalable Coordination, LEACH, TEEN, APTEEN and Adapting to the dynamic nature of Wireless Sensor Networks.

**Random vs structured WSN:** Localization, Hierarchy, organization, Stationary vs. mobile, Energy efficient routing, sleeping modes, issues in WSNs

**TEXT BOOKS**

1. D.P. Agrawal and Qing-An zeng, “Introduction to Wireless and Mobile Systems” Thomson Learning

**REFERENCES**

1. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley, 2003
2. Kavesh Pahlavan and Prashant Krishnamurty - “Principles of Wireless Networks – A unified Approach, Pearson Education, 2002



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**Semester: 7<sup>th</sup>**

Course	Code	L	T	P	Credits
Elective-I	IT 604	3	1	0	4

**Information System Design**

**MANAGING THE DIGITAL FIRM :** Why information systems – contemporary approaches to information systems – new role of information, systems- major types of systems in organizations – systems from a functional perspective – enterprise, applications – organizations and information systems – managers decision making and information systems– information systems and business strategy.

**DESIGNING INFORMATION SYSTEMS :** Systems as planned organizational change – business process re-engineering and process improvement –overview of systems development – alternate system – Building approaches – Understanding the business value of Information Systems - The importance of change management in information system success and failure – Managing Implementation.

**DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS:** Systems analysis and design – System development life cycle – Limitation – End User Development –Managing End Users – off-the shelf software packages – Outsourcing – Comparison of different methodologies.

**KNOWLEDGE MANAGEMENT, ETHICS AND SECURITY**

Knowledge Management in the organization – Information and Knowledge base systems – Decision - support systems – Understanding ethical and Social issues packed to systems – Ethics in an Information society – The moral dimensions of Information Systems – System vulnerability and abuse – Creating a control environment – Ensuring System Quality.

**INFORMATION ARCHITECTURE:** Defining Information Architecture – why Information Architecture matters – Practicing Information, Architecture in the Real world – Information Ecologies – User needs and Behavior – The anatomy of Information Architecture – Organizing Systems – Search Systems.

**Text Books:**

1. Lauaon Kenneth & Landon Jane, "Management Information Systems: Managing the Digital firm", Eighth edition, PHI
2. Uma G. Gupta, "Management Information Systems – A Management Prespective", Galgotia publications Pvt., Ltd
3. Louis Rosenfel and Peter Morville, "Information Architecture for the World wide Web", O'Reilly Associates

**REFERENCES**

1. Steven Alter, "Information Systems – A Management Perspective", Pearson Education
2. Uma Gupta, "Information Systems – Success in 21st Century", Prentice Hall of India
3. Robert G. Murdick, Joel E. Ross and James R. Claggett, "Information Systems for Modern Management", PHI

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**Semester: 7<sup>th</sup>**

**Medical Informatics**

**MEDICAL DATABASE IMPLEMENTATION:** Medical data acquisition and database systems: PC based multichannel data acquisition system; storage, analysis and retrieval techniques.

**VISUAL BASIC :** Visual programming concepts; visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical information System.

**COMPUTERS IN SYSTEM DESIGN:** Hospital Information System its design and functional characteristics; Principles and application of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine.

**MULTIMEDIA AND VIRTUAL REALITY APPLIED TO MEDICINE:** Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine.

**COMPUTERS IN MEDICAL RESEARCH:** Medical Informatics and its levels; Design and development of educational packages on medical sciences; Integrated design concepts; Interactive multimedia, Virtual and digital libraries, Internet and its applications.

**TEXT BOOK**

1. R.D.Lele, "Computer in Medicine", Tata McGraw-Hill, New Delhi

**REFERENCES**

1. Tay Vaughan, "Multimedia making it work", Tata McGraw-Hill, New Delhi

**Semester: 7<sup>th</sup>**

## **Telecom Switching Systems**

**Introduction:** Evolution of Telecommunications, Basic of switching System, Telecommunication transmission, digital Transmission, Four wire circuits, FDM, TDM, PDH, SDH. .PCM Transmission path & reception path, Transmission formats for 24-channel and 30-channel systems.

**Evolution of Switching System:** Strowger, Rotary Dial Telephone, Signaling Tones, Step by Step Switching, Design Parameters, Crossbar Switching: Principal of Common Control, Touch Tone Dial Telephone, and Principals of Crossbar Switching, Digital Switching.

**Electronic Space Division:** SPC, Distributed SPC, Software Stored Program Control, Centralized Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three-Stage Networks, n-Stage Networks.

**Time Division Switching:** Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Grade of Service, Non blocking Networks, Synchronization.

**Control of Switching System:** Call processing function, Common Control, stored Program Control

**Signaling Techniques:** In channel Signaling, Common Channel Signaling, Signaling System-6 (SS6), Signaling System-7 (SS7).

**Traffic Engineering:** Network Traffic Load and Parameters Grade of Service and Blocking Probability, Modeling switching Systems, Incoming Traffic and Service Time Characterizations, Blocking Models and Loss Estimates, Delay Systems, Traffic Measurement, Lost call System, Queuing System.

**Telecom Networks:** Introduction, Analog Networks, Integrated Digital Networks, Integrated services Digital Networks, Cellular radio Networks, Intelligent Networks, Private Networks, Numbering, National Schemes, International Numbering, Numbering Plan for the ISDN , Public Data Networks, Charging, Routing, General, Automatic alternative routing, Numbering, Network Management, IN, VPN, B-ISDN Telecommunications Network, Management.

**Management Platforms:** The Well-designed Platform system, Methods and tools, Standards and platform building blocks.

**Management of Personal communication systems:** Managing Mobile Networks – from cellular to satellite networks.

### **Text & Reference Books:**

1. Telecommunication Switching Systems and Networks By Viswanathan (PHI).
2. Telecommunication Switching Traffic and Network By J.E.Flood (Pearson Education).
3. Telecommunication Transmission Systems By Robert G. Winch, (MGH).
4. Introduction to Telecommunication Voice, Data, Internet By Wayne Tomasi, (PHI).
5. Mobile Cellular Telecommunication By William C. Y. Lee, (Mc Graw Hill).
6. Digital Telephony, By John C. Bella (John wiley & Sons).

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**Semester: 7<sup>th</sup>**

**Cryptography & Network Security**

**INTRODUCTION** : OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality

**PUBLIC KEY CRYPTOGRAPHY** : Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography -Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.

**AUTHENTICATION AND HASH FUNCTION:** Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard

**NETWORK SECURITY** : Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP –S/MIME - IP Security – Web Security.

**SYSTEM LEVEL SECURITY:** Intrusion detection – password management – Viruses and related Threats – Virus Counter measures –Firewall Design Principles – Trusted Systems.

**TEXT BOOK**

1. William Stallings, “Cryptography And Network Security – Principles and Practices”, Prentice Hall of India

**REFERENCES**

1. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill
2. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Third Edition, Pearson Education