ANNA UNIVERSITY, CHENNAI 600 025

UNIVERSITY DEPARTMENTS

R 2013

B.E. (PART TIME) COMPUTER SCIENCE AND ENGINEERING
I TO VII SEMESTERS CURRICULUM AND SYLLABUS

SEMESTER I

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTMA8151	Applied Mathematics	3	0	0	3
PTPH8153	Physics for Information Science	3	0	0	3
PTCS8101	Digital Principles and System Design	3	0	0	3
PTGE8151	Computing Techniques	3	0	0	3
PTCS8102	Principles of Computer Engineering	3	0	0	3
	TOTAL CREDITS	**15**	**0**	**0**	**15**

SEMESTER II

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTCS8201	Computer Architecture	3	0	0	3
PTCS8202	Data Structures	3	0	0	3
PTCS8203	Programming using C++	3	0	0	3
PTCS8204	Database Management Systems	3	0	0	3
PRACTICAL					
PTCS8211	Programming Laboratory	0	0	3	2
	TOTAL CREDITS	**12**	**0**	**3**	**14**

SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTCS8301	Java and Internet Programming	3	0	0	3
PTCS8351	Operating Systems	3	0	0	3
PTCS8352	Software Engineering	3	0	0	3
PTGE8251	Environmental Science and Engineering	3	0	0	3
PRACTICAL					
PTCS8311	Java and Internet Programming Laboratory	0	0	3	2
	TOTAL CREDITS	**12**	**0**	**3**	**14**

SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTCS8401	Artificial Intelligence	3	0	0	3
PTCS8402	Computer Graphics and Multimedia	3	0	0	3
PTCS8403	Data Communication and Computer Networks	3	0	0	3
PTCS8451	Object Oriented Analysis and Design	3	0	0	3
PRACTICAL					
PTCS8411	Case Tools Laboratory	0	0	3	2
	TOTAL CREDITS	**12**	**0**	**3**	**14**

SEMESTER V

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTCS8501	Mobile and Pervasive Computing	3	0	0	3
PTCS8502	Security in Computing	3	0	0	3
E1	Elective I	3	0	0	3
E2	Elective II	3	0	0	3
PRACTICAL					
PTCS8511	Mobile Application Development Laboratory	0	0	3	2
	TOTAL CREDITS	**12**	**0**	**3**	**14**

SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTCS8601	Data Warehousing and Data Mining	3	0	0	3
PTCS8602	Service Oriented Architecture	3	0	0	3
E3	Elective-III	3	0	0	3
E4	Elective-IV	3	0	0	3
PRACTICAL					
PTCS8611	Software Development Laboratory	0	0	3	2
	TOTAL CREDITS	**12**	**0**	**3**	**14**

SEMESTER VII

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
PTCS8701	Cloud Computing and Services	3	0	0	3
PTMG8551	Principles of Management	3	0	0	3
	Elective V	3	0	0	3
PRACTICAL					
PTCS8711	Project Work	0	0	9	6
	TOTAL CREDITS	**9**	**0**	**9**	**15**

TOTAL NO. OF CREDITS: 100

ELECTIVES

COURSE CODE	COURSE TITLE	L	T	P	C
PTCS8001	.Net & C# Programming	3	0	0	3
PTCS8002	Adhoc & Sensor Networks	3	0	0	3
PTCS8003	Advanced Topics on Databases	3	0	0	3
PTCS8004	Bio Informatics Technologies	3	0	0	3
PTCS8005	Computational Intelligence	3	0	0	3
PTCS8006	Database Tuning	3	0	0	3
PTCS8007	E-Learning Techniques	3	0	0	3
PTCS8008	Graph Theory & Combinatorics	3	0	0	3
PTCS8009	Green Computing	3	0	0	3
PTCS8010	Human Computer Interaction	3	0	0	3
PTCS8011	Information Retrieval & Management	3	0	0	3
PTCS8012	Middleware Technologies	3	0	0	3
PTCS8013	Nano Computing	3	0	0	3
PTCS8014	Natural Language Processing	3	0	0	3
PTCS8015	Network Analysis & Management	3	0	0	3
PTCS8016	Principles of Cryptography & Network Security	3	0	0	3
PTCS8017	Principles of Distributed Systems	3	0	0	3
PTCS8018	Principles of Embedded & Real Time Systems	3	0	0	3
PTCS8019	Software Quality & Testing	3	0	0	3
PTCS8020	System Modeling & Simulation	3	0	0	3
PTCS8071	Cyber Forensics	3	0	0	3
PTCS8072	Game Programming	3	0	0	3
PTCS8073	Semantic Web	3	0	0	3
PTCS8074	Software Agents	3	0	0	3
PTCS8075	UNIX Internals	3	0	0	3
PTGE8551	Engineering Ethics and Human Values	3	0	0	3
PTIT8071	Digital Image Processing	3	0	0	3
PTIT8072	Free & Open Source Software	3	0	0	3
PTIT8073	TCP/IP Design & Implementation	3	0	0	3
PTMG8651	Total Quality Management	3	0	0	3
PTCS8075	Foundation Skills in Integrated Product Development	3	0	0	3
PTGE8071	Disaster Management	3	0	0	3
PTGE8072	Human Rights	3	0	0	3

PTMA8151   **APPLIED MATHEMATICS**   **L T P C**
                (Common to all branches of B.E / B.Tech (PT) Programmes)   **3 0 0 3**

OBJECTIVE:
- To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

UNIT I   MATRICES   9
Characteristic equation – Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Cayley - Hamilton Theorem – Diagonalization of matrices - Reduction of a quadratic form to canonical form by orthogonal transformation.

UNIT II   FUNCTIONS OF SEVERAL VARIABLES   9
Partial derivatives – Homogeneous functions and Euler's theorem – Total derivative – Differentiation of implicit functions – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables - Maxima and minima of functions of two variables.

UNIT III   ANALYTIC FUNCTION   9
Analytic functions – Necessary and sufficient conditions for analyticity – Properties – Harmonic conjugates – Construction of analytic function – Conformal Mapping – Mapping by functions w = a + z , az, 1/z, - Bilinear transformation.

UNIT IV   COMPLEX INTEGRATION   9
Line Integral – Cauchy's theorem and integral formula – Taylor's and Laurent's Series – Singularities – Residues – Residue theorem – Application of Residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

UNIT V   LAPLACE TRANSFORMS   9
Existence conditions – Transforms of elementary functions – Basic properties – Transforms of derivatives and integrals –Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients.

                                                              TOTAL: 45 PERIODS
OUTCOMES:
- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

BOOKS FOR STUDY:
1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Forty Second Edition, Delhi, 2012.
2. Ramana, B.V. Higher Engineering Mathematics" Tata McGraw Hill Publishing Company, 2008.

REFERENCES:
1. Glyn James, Advanced Modern Engineering Mathematics, Prentice Hall of India, Fouth Edition, 2011.
2. Veerarajan, T., Engineering Mathematics (For First Year), Tata McGraw-Hill Pub. Pvt. Ltd., New Delhi, 2007.

PTPH8153   **PHYSICS FOR INFORMATION SCIENCE**   **L T   P C**
             (Common to Computer Science and Information Technology Branches)   **3 0   0 3**

OBJECTIVE:
To understand the essential principles of Physics of semiconductor device and Electron transport properties.   Become proficient in magnetic and optical properties of materials and Nano electronic devices.

UNIT I   ELECTRICAL PROPERTIES OF MATERIALS   9
Electrical conduction – Classification of conducting materials – Free electron theory - Expression for electrical conductivity – Thermal conductivity, expression -   Wiedemann-Franz law – Ohm's law – Classical free electron theory (advantages and drawbacks) - Quantum free electron theory – Schrodinger wave equation – Applications of Schrodinger wave equation (Particle in infinite potential well, Particle in a box, Reflection and transmission of electron waves) – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – Electron effective mass.

UNIT II   SEMICONDUCTORS AND TRANSPORT PHYSICS   9
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap   semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic   semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

UNIT III   MAGNETIC PROPERTIES OF MATERIALS   9
Classification of magnetic materials – Quantum numbers – Magnetic moment – Classical theory of diamagnetism (Langevin theory) – Theory of paramagnetism –   Ferromagnetism (Weiss theory) – Antiferromagnetic materials – Ferrites – Hard soft magnetic materials – Magnetic recording materials – Bubble memory – Magnetic principle in computer data storage – Magnetic tape – Floppy disc – Magnetic hard disc.

UNIT IV   OPTICAL PROPERTIES OF MATERIALS   9
Classification of optical materials – Absorption in metals, insulators & Semiconductors - LED's – Organic LED's – Polymer light emitting materials – Plasma light emitting   devices – LCD's – Laser diodes – Optical data storage techniques (including DVD, Blue -ray disc, Holographic data storage).

UNIT V   NANO DEVICES   9
The density of state for solids – Electron density in a conductor – Significance between Fermi energy and Volume of the material – Quantum confinement – Quantum structures – Metal-to-insulator transition – Confining excitons – Band gap of nanomaterials –Tunneling – Resonant Tunneling Diodes (RTD's) – Single electron phenomena – Single electron Transistor – Quantum cellular automata (QCA) – Carbon nanotubes – Molecular electronic structures – Spintronics.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the students will be able to
- Understand the electrical, magnetic and optical properties of semiconductor materials
- Understand the concepts and applications of semiconductor devices

TEXT BOOKS:
1. P.K. Palanisamy, "Materials Science", Scitech, (2003).
2. S.O. Kasap, "Principles of Electronic Materials and Devices", Tata McGraw-Hill, (2007).
3. R.F. Pierret, "Semiconductor Device Fundamentals", Pearson, (1996).

REFERENCES:
1. N. Garcia and A. Damask, "Physics for Computer Science Students", Springer-Verlag,1991.
2. S. Datta, "Quantum Transport: Atom to Transistor", Cambridge University Press, 2005

PTCS8101	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L T P C
		3 0 0 3

OBJECTIVES:
- To familiarize basic and advanced operations of boolean algebra
- To learn the designing of combinational and sequential circuits from Boolean functions
- To analyse the logic design using hardware description languages
- To know the application of logic design in advanced digital circuits like RAM and ROM

UNIT I   BOOLEAN ALGEBRA AND LOGIC GATES   9
Review of Number Systems – Arithmetic Operations – Binary Codes – Boolean Algebra and Theorems – Boolean Functions – Simplification of Boolean Functions using Karnaugh Map and Tabulation Methods – Logic Gates – NAND and NOR Implementations.

UNIT II   COMBINATIONAL LOGIC   9
Combinational Circuits – Analysis and Design Procedures – Circuits for Arithmetic Operations, Code Conversion – Decoders and Encoders – Multiplexers and Demultiplexers – Introduction to HDL – HDL Models of Combinational circuits.

UNIT III   SYNCHRONOUS SEQUENTIAL LOGIC   9
Sequential Circuits – Latches and Flip Flops – Analysis and Design Procedures – State Reduction and State Assignment – Shift Registers – Counters – HDL for Sequential Logic Circuits.

UNIT IV   ASYNCHRONOUS SEQUENTIAL LOGIC   9
Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

UNIT V   MEMORY AND PROGRAMMABLE LOGIC   9
RAM and ROM – Memory Decoding – Error Detection and Correction – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices – Application Specific Integrated Circuits.

TOTAL: 45 PERIODS

OUTCOMES:
- To reduce simple Boolean functions using K-Maps
- To reduce complex Boolean functions using Tabulation method
- To transform logic circuits using universal logic gates
- To convert between digital codes using encoder/decoder
- To compile batch of digital operations using multiplexer/demultiplexer
- To design counting logic circuits using shift registers/digital counters
- To reduce state tables and state transition tables in asynchronous logic design
- To demonstrate error detection and error correction using digital circuits

TEXT BOOK:
1. M. Morris Mano and Michael D. Ciletti, "Digital Design", IV Edition, Pearson Education, 2008.

REFERENCES:
1. John F. Wakerly, "Digital Design Principles and Practices", Fourth Edition, Pearson Education, 2007.
2. Charles H. Roth Jr, "Fundamentals of Logic Design", Fifth Edition – Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, "Digital Principles and Design", Tata MC Graw Hill, 2003.
4. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010.

PTGE8151	COMPUTING TECHNIQUES	L T P C
		3 0 0 3

OBJECTIVES:
The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I   INTRODUCTION   8
Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II   C PROGRAMMING BASICS   10
Problem formulation – Problem Solving - Introduction to ' C' programming –fundamentals – structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in 'C' – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III   ARRAYS AND STRINGS   9
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV   FUNCTIONS AND POINTERS   9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V   STRUCTURES AND UNIONS   9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design C Programs for problems.
- Write and execute C programs for simple applications

TEXT BOOKS:
1. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
2. Ashok N. Kamthane, "Computer programming", Pearson Education, 2007.
3. Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.

REFERENCES:
1. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2006
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
3. R.G. Dromey, "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007

PTCS8102   **PRINCIPLES OF COMPUTER ENGINEERING**   **L T P C**
      3 0 0 3

OBJECTIVES:
- To know the evolution of computers
- To understand the basics of computer operations
- To differentiate between various streams of programming
- To understand the functions of operating systems
- To learn the basics of database management systems
- To learn the basics of computer networks

UNIT I   INTRODUCTION   9

Characteristics of computers – Evolution of Computers – Evaluation of computers – Computer generations – Units of Data storage – Coding data in storage – Program planning – Algorithms – Evaluation of Algorithms - Flow charts – Pseudocodes.

UNIT II   SOFTWARE & HARDWARE   9

Basic computer operations – Classification of computers – Hardware components – Bus Architecture and instruction sets – Computer Ethics - Generation of Languages – Compiler & Interpreters – Virtual Machines – Procedural programming – Object oriented programming – Scripting languages – Functional languages – Language design – Language syntax and semantics.

UNIT III   OPERATING SYSTEMS   9

Role of OS – Types of OS – Functions of OS – Process Management – Memory Management – File Management – Device Management – Security – MS-DOS – UNIX – Windows – Current trends of OS.

UNIT IV   DATABASE MANAGEMENT   9

File based approach and Database approach – Evolutions of data models – Three levels architecture for DBMS – Data independence – Data dictionary – Database administrator – Database languages.

UNIT V   NETWORKS   9

Definition and purpose of computer Networks – Open systems interconnections – Types of networks – Topologies in Network Design – Switching Technologies – TCP/IP Network model – Networking Devices – Internet – www and network security.

TOTAL: 45 PERIODS

OUTCOMES:
- To exercise the algorithmic /pseudocode approach to program design
- To appreciate the use of compiler and interpreter
- To identify the difference between the operations of MS-DOS, WINDOWS and UNIX
- To be able to write queries in database languages
- To explain the network topology within department / institute laboratories

TEXT BOOKS:
1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, Third Edition, BPB Publications, New Delhi, 2003.
2. Carl Reynolds and Paul Tymann, Principles of Computer Science, Schaum's Outline Series, McGraw Hill, New Delhi, 2008.
3. Sanjay Silakari and Rajesh K. Shukla, Basic Computer Engineering, Wiley- India, 2011.

REFERENCE:
1. Bhanu Pratap, Computer Fundamentals, Cyber Tech Publications, New Delhi, 2011.

PTCS8201	COMPUTER ARCHITECTURE	L T P C
		3 0 0 3

OBJECTIVES:
- To learn the fundamentals of computer architecture
- To know the concepts behind parallelism and pipelining
- To learn advanced concepts in Instruction level parallelism
- To get introduced to binary arithmetic
- To learn about virtual memory, associative memory and memory management

UNIT I   FUNDAMENTALS OF A COMPUTER SYSTEM   9

Functional Units of a Digital Computer – Hardware – Software Interface –Translation from a High Level Language to the Hardware Language – Instruction Set Architecture – Styles and features – RISC and CISC Architectures – Performance Metrics – Amdahl's Law – Case Studies of ISA.

UNIT II   BASIC PROCESSING UNIT   9
Components of the Processor – Datapath and Control – Execution of a Complete Instruction – Hardwired and Micro programmed Control – Instruction Level Parallelism – Basic Concepts of Pipelining – Pipelined Implementation of Datapath and Control – Hazards – Structural, Data and Control Hazards –Exception handling.

UNIT III   ADVANCED CONCEPTS IN ILP AND CURRENT TRENDS   9
Exploitation of more ILP – Hardware and Software Approaches – Dynamic Scheduling – Speculation – Compiler Approaches – Multiple Issue Processors. – ILP and Thread Level Parallelism – Current Trends – Multicore Processors – Graphics and Computing GPUs.

UNIT IV   ARITHMETIC FOR COMPUTERS   9
Addition and Subtraction – Fast Adders – Binary Multiplication – Binary Division – Floating Point Numbers – Representation, Arithmetic Operations.

UNIT V   MEMORY AND I/O   9
Need for a hierarchical memory system – Types and characteristics of memories – Cache memories – Improving cache performance – Virtual memory – Memory management techniques – Associative memories.

Accessing I/O devices – Programmed Input/Output – Interrupts – Direct Memory Access – Interface circuits – Need for Standard I/O Interfaces like PCI, SCSI, USB.

TOTAL: 45 PERIODS

OUTCOMES:
- To identify the functional units in a digital computer system
- To distinguish between the various ISA styles
- To trace the execution sequence of an instruction through the processor
- To compare different approaches used for implementing a functional unit
- To write programs involving interrupt handling

TEXT BOOK:
1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.
3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
4. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007.
5. V.P. Heuring, H.F. Jordan, "Computer Systems Design and Architecture", Second Edition, Pearson Education, 2004.
6. Behrooz Parhami, "Computer Architecture", Oxford University Press, 2007.

PTCS8202   **DATA STRUCTURES**   **L T P C**
                                                                                 3 0 0 3

OBJECTIVES:
- To learn program independent view of data structures
- To know the data structure representation and various operations performed on them
- To learn algorithms for sorting, searching and indexing

UNIT I   **LINEAR DATA STRUCTURES**   **11**
Abstract Data Types - Asymptotic Notations: Big-Oh, Omega and Theta – Best, Worst and Average case Analysis: Definition and an example – Arrays and its representations – Stacks and Queues – Linked lists – Linked list based implementation of Stacks and Queues – Evaluation of Expressions – Linked list based polynomial addition.

UNIT II   **NON-LINEAR DATA STRUCTURES**   **9**
Trees – Binary Trees – Binary tree representation and traversals – Threaded binary trees – Binary tree representation of trees – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Connected components.

UNIT III   **SEARCH STRUCTURES   AND PRIORITY QUEUES**   **9**
AVL Trees – Red-Black Trees – Splay Trees – Binary Heap – Leftist Heap

UNIT IV   **SORTING**   **8**
Insertion sort – Merge sort – Quick sort – Heap sort – Sorting with disks – k-way merging – Sorting with tapes – Polyphase merge.

UNIT V   **SEARCHING AND INDEXING**   **8**
Linear Search – Binary Search - Hash tables – Overflow handling – Cylinder Surface Indexing – Hash Index – B-Tree Indexing.

                                                   TOTAL : 45 PERIODS

OUTCOMES:
- To analyse the programs and express their time complexity
- To write programs using linear and non-linear data structures
- To write programs for sorting, searching and indexing

TEXT BOOKS:
1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Book Sorce, Gurgon, 1976.
2. Gregory L. Heilman, Data Structures, Algorithms and Object Oriented Programming, Tata Mcgraw-Hill, New Delhi, 2002.

REFERENCES:
1. Jean-Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Second Edition, Tata McGraw-Hill, New Delhi, 1991.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures & Algorithms, Pearson Education, New Delhi, 2006.

PROGRAMMING USING C++ **L T P C**
3 0 0 3

OBJECTIVES:
- To develop programming skills from OO perspective
- To get introduced to handling pointer operations in combination with Object-orientation
- To learn to handle exceptions in OO operations
- To learn advanced file handling and stream operations

UNIT I   POINTERS AND FILE HANDLING IN C   9
Introduction to Pointers – Pointers and arrays – Pointers and structures –Pointers to functions – Applications of pointers – File Handling – Case study

UNIT II   INTRODUCTION TO OBJECT-ORIENTED PROGRAMMING   9
Introduction – Procedure vs. object oriented programming – Data types – control structures – Arrays and Strings – User defined types – Functions and Pointers – Case study

UNIT III   OBJECT ORIENTED PROGRAMMING CONCEPTS   9
Classes and Objects – Operator Overloading – Inheritance – Polymorphism and Virtual Functions – Case study

UNIT IV   TEMPLATES AND EXCEPTION HANDLING   9
Function templates and class templates – Namespaces – Casting – Exception Handling – Case study.

UNIT V   FILES AND ADVANCED FEATURES   9
C++ Stream classes – Formatted IO – File classes and File operations – Dynamic memory allocation – Standard Template Library – Case Study.
TOTAL: 45 PERIODS

OUTCOMES:
- To write programs using pointers in combination with arrays, structures and functions
- To be able to convert a procedure-oriented program into object-oriented program
- To write OO programs using overloading
- To write programs that handle exceptions
- To write programs using dynamic memory allocation

TEXT BOOKS:
1. Yashavant Kanetkar, "Understanding Pointers in C", 4th Revised & Updated Edition, 2008, BPB Publications.
2. HM Deitel and PJ Deitel "C++ How to Program", Seventh Edition, 2010, Prentice Hall.

REFERENCES:
1. Brian W. Kernighan and Dennis M. Ritchie, "The C programming Language", 2006, Prentice-Hall.
2. E Balagurusamy, "Object oriented Programming with C++", Third edition, 2006, Tata McGraw Hill.
3. Bjarne Stroustrup, "The C++ Programming language", Third edition, Pearson Education.
4. Horstmann "Computing Concepts with C++ Essentials",Third Edition,2003, John Wiley.
5. Herbert Schildt, "The Complete Reference in C++", Fourth Edition, 2003, Tata McGraw Hill.
6. Robert Lafore, "Object Oriented Programming in C++", 2002, Pearson education.

PTCS8204	DATABASE MANAGEMENT SYSTEMS	L T P C
	(Common to CSE & IT programmes)	3 0 0 3

OBJECTIVES:
- To learn the fundamentals and issues in database systems
- To appreciate the design of databases using relational models
- To learn data definition and query languages
- To understand the importance of transaction management in databases
- To emphasize the need for sorting and indexing in databases
- To learn advanced representations of databases suited for real-time applications

UNIT I   INTRODUCTION TO DATABASE SYSTEMS   9
Data - Database Applications - Evolution of DB & DBMS - Need for data management – Data models & Database Architecture - Professions in DBMS - Key issues and challenges in Database Systems

UNIT II   ER & RELATIONAL MODELS   9
ER Diagrams - Relational Model - ER to Relational Mapping - Constraints - Keys - Dependencies - Relational Algebra - Normalisation - First, Second, Third BCNF - Fourth Normal Form – Fifth Normal Form.

UNIT III   DATA DEFINITION & QUERYING   8
Basic DDL - Introduction to SQL - Data Constraints - Triggers - Database Security – Advanced SQL - Embedded & Dynamic SQL - Views

UNIT IV   TRANSACTIONS & CONCURRENCY   10
Introduction to Transactions - Transaction Systems - ACID Properties - System & Media Recovery - Two Phase Commit Protocol - Recovery with SQL - Need for Concurrency - Locking Protocols - Deadlocks & Managing Deadlocks - SQL Support for Concurrency

UNIT V   ADVANCED TOPICS IN DATABASES   9
Indexing & Hashing Techniques - Query Processing & Optimization - Sorting & Joins – Database tuning - Introduction to Special Topics - Spatial & Temporal Databases - Data Mining & Warehousing - Data Visualisation - Mobile Databases - OODB & XML Databases - Multimedia & Web Databases.

TOTAL : 45 PERIODS

OUTCOMES:
- To classify modern and futuristic database applications based on size and complexity
- To design a database from understanding an Universe of Discourse, using ER diagrams
- To be able to map ER model with Relational model
- To write queries using normalization criteria
- To create a physical database from a design using DDL
- To compare and contrast various indexing strategies in different database systems
- To critique how advanced databases differ from traditional databases.

TEXT BOOKS:
1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2010
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database   Systems",Sixth Edition, Pearson / Addision wesley, 2010
3. Raghu Ramakrishnan, "Database Management Systems", Third Edition, McGrawHill, 2002.

PTCS8211   **PROGRAMMING LABORATORY**   **L T P C**
                                                                           0 0 3 2

OBJECTIVES:
The student should be made to:
- Understand the use of Functions, Pointers and Files in C.
- Understand the Object Oriented Programming concepts of C++
- Analyze the use of advanced Object Oriented features in an application.

LIST OF EXPERIMENTS:
1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

                                                          TOTAL: 45 PERIODS
LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
30 Terminals with C and C++ Compiler

OUTCOMES:
At the end of this course, the student will be able to:
- Write programs using Functions and Pointers in C.
- Design applications using Object Oriented Concepts
- Design Programs that use advanced concepts of C++
- Write Programs using Templates and Files using C++
- Critically analyze the use of C and C++ programming languages
   for different types of applications

PTCS8301   **JAVA AND INTERNET PROGRAMMING**   **L T P C**
                                                                      3 0 0 3
OBJECTIVES:
- To comprehend the concepts of core java and working principles of Internet
- To learn client-server programming and web development
- To learn concepts related to web application development

UNIT I   JAVA FUNDAMENTALS   9
Overview of Java, Fundamental Programming Structures, Strings – Objects, Classes and Methods - Inheritance - Packages and Interfaces - Exception Handling, Collections - Multithreading – Java I/O Streams, File Handling.

UNIT II   INTERNET BASICS AND JAVA NETWORK PROGRAMMING   9
Internet Addressing, Browsers, Servers, Protocols – Web Application Architectures, Development – Scripting Languages – Databases – Search Engines – Web Services – Collective Intelligence – Mobile Web – Features of Web 3.0
Overview of Java Networking - TCP - UDP - InetAddress and Ports - Socket Programming - Working with URLs - Internet Protocols simulation - HTTP - SMTP - POP - FTP - Remote Method Invocation.

UNIT III   CLIENT-SIDE PROGRAMMING   9

Scripting for content structuring, form design, client side validation, dynamic page generation, adding interactivity, styles, using HTML, DHTML, XHTML, CSS, Java Script – XML - Document Type Definition - XML Schema - Document Object Model - Presenting XML - Using XML Parsers: DOM and SAX - Web applications with AJAX - AJAX Framework - Java Applets – AWT-Swing

UNIT IV   SERVER-SIDE PROGRAMMING   9

Types of servers - Configuring and Using Web servers, Setting up Databases, Java Database Connectivity -Handling form data, validation, querying databases, information retrieval, response generation, Session management - using PHP, Servlets, JSP, ASP. NET.

UNIT V   WEB APPLICATION DEVELOPMENT   9

Creating Interactive Websites - Search engines – cookies - Blogs - Social web applications - developing WIKI pages – Programming for the Mobile web.

TOTAL : 45 PERIODS

OUTCOMES:
- To write java programs using inheritance and exception handling
- To write programs using socket programming
- To write programs for client-side and server-side programming
- To create interactive web-sites and social web applications

TEXT BOOKS:
1. Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw-Hill Osborne Media, 2011.
2. Paul Deitel, "Internet & World Wide Web: How to Program", Prentice Hall, 4th Edition, 2007.

REFERENCES:
1. Cay S. Horstmann and Gary Cornell, "Core Java™, Volume I – Fundamentals" 8th Edition, Prentice Hall, 2007.
2. Cay S. Horstmann and Gary Cornell, "Core Java, Vol. 2: Advanced Features", 8th Edition, Prentice Hall, 2008.
3. Robert W. Sebesta, "Programming the World Wide Web", Addison-Wesley,Sixth Edition, 2010.
4. Elliotte Rusty Harold, "Java Network Programming", Third Edition, O'Reilly,2004.
5. Uttam K.Roy, "Web Technologies", Oxford University Press, 1st Edition, 2010.
   Leon Shklar and Rich Rosen, "Web Application Architecture: Principles,
6. Protocols and Practices", Wiley, 2nd Edition, 2009.
   http://www.w3schools.com/

PTCS8351   OPERATING SYSTEMS   L T P C
**   (Common to ECE,CSE ,IT & EEE branches)   3 0 0 3**

OBJECTIVES:
- To learn the components and operations of operating systems
- To get an idea about process synchronization
- To learn concepts behind inter-process communication
- To learn disk scheduling and process scheduling
- To understand deadlock handling and memory management

UNIT I   **OPERATING SYSTEMS OVERVIEW**   **9**

Introduction to operating systems – Computer system organization, architecture – Operating system structure, operations – Process, memory, storage management – Protection and security – Distributed systems – Computing Environments – Open-source operating systems – OS services – User operating-system interface – System calls – Types – System programs – OS structure – OS generation – System Boot – Process concept, scheduling – Operations on processes – Cooperating processes – Inter-process communication – Examples – Multithreading models – Thread Libraries – Threading issues – OS examples

UNIT II   **PROCESS MANAGEMENT**   **9**

Basic concepts – Scheduling criteria – Scheduling algorithms – Thread scheduling – Multiple-processor scheduling – Operating system examples – Algorithm Evaluation – The critical-section problem – Peterson's solution – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors – Synchronization examples – Deadlocks – System model – Deadlock characterization – Methods for handling deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock detection – Recovery from deadlock

UNIT III   **STORAGE MANAGEMENT**   **9**

Memory Management – Swapping – Contiguous memory allocation – Paging – Segmentation – Example: The Intel Pentium - Virtual Memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing**.**

UNIT IV   **I/O SYSTEMS**   **9**

File concept – Access methods – Directory structure – File-system mounting –Protection – Directory implementation – Allocation methods – Free-space management – Disk scheduling – Disk management – Swap-space management – Protection

UNIT V   **CASE STUDY**   **9**

The Linux System – History – Design Principles – Kernel Modules – Process Management – Scheduling – Memory management – File systems – Input and Output – Inter-process Communication – Network Structure – Security – Windows 7 – History – Design Principles – System Components – Terminal Services and Fast User – File system – Networking.

                                                 TOTAL: 45 PERIODS

OUTCOMES:
- To write programs using multi-threading
- To solve problems related to process scheduling and disk scheduling
- To use synchronization concepts in real-time programs
- To apply banker's algorithm for solving problems in deadlocks
- To solve problems related to paging and segmentation
- To implement OS concepts in Linux

TEXT BOOK:
1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts Essentials", John Wiley & Sons Inc., 2010.

REFERENCES:
1. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
3. D M Dhamdhere, " Operating Systems: A Concept-based Approach", Second Edition, Tata McGraw-Hill Education, 2007.
4. William Stallings, "Operating Systems: Internals and Design Principles", Seventh Edition, Prentice Hall, 2011.

PTCS8352   **SOFTWARE ENGINEERING**   **L T P C**

                                                                                      3 0 0 3
                              (Common to CSE & IT branches)
OBJECTIVES:
- To provide an overview of software engineering
- To emphasize on following CMM
- To learn detailed concepts related to software engineering life cycle
- To understand the concepts of verification and validation
- To appreciate the necessity of assessing software quality and measurements

UNIT I   SOFTWARE PROCESS MODELS   9
The Evolving role of Software – Software – The changing Nature of Software – Legacy software
— A generic view of process– A layered Technology – A Process Framework – The Capability
Maturity Model Integration (CMMI) – Process Assessment – Personal and Team Process Models
– Product and Process – Process Models – The Waterfall Model – Incremental Process Models
– Incremental Model – The RAD Model – Evolutionary Process Models – Prototyping – The
Spiral Model – The Concurrent Development Model – Specialized Process Models – the Unified
Process.

UNIT II   REQUIREMENT ENGINEERING   9
Software Engineering Practice – communication Practice – Planning practice Modeling
practice– Construction Practice –Deployment. Requirements Engineering - Requirements
Engineering tasks – Initiating the requirements Engineering Process- Eliciting Requirements –
Developing Use cases – Building the Analysis Models – Elements of the Analysis Model –
Analysis pattern – Negotiating Requirements – Validating Requirements.

UNIT III   ANALYSIS MODELLING   9
Requirements Analysis – Analysis Modeling approaches – data modeling concepts – Object
oriented Analysis – Scenario based modeling – Flow oriented Modeling – Class based modeling
– creating a behaviour model.

UNIT IV   DESIGN & TESTING   9
Design Engineering – Design process -Design Quality-Design model-User interface Design –
Testing strategies- Testing Tactics - strategies Issues for conventional and object oriented
software-validation testing –system testing –Art of debugging – Project management

UNIT V   QUALITY & MAINTENANCE   9
Software evolution - Verification and Validation -Critical Systems Validation – Metrics for
Process, Project and Product-Quality Management -Process Improvement –Risk Management-
Configuration Management – Software Cost Estimation.
                                                                    TOTAL: 45 PERIODS

OUTCOMES:
- To differentiate the perspective of various software process models
- To elicit the requirements for real-time problems
- To compile a SRS pertaining to industry standards
- To create a behavioral model from the set of requirements
- To develop a user-interface design for the given system
- To outline various software metrics and their context in measuring software programs
- To estimate the software cost

TEXT BOOKS:
1. Roger S.Pressman, Software Engineering: A Practitioner's Approach, McGraw Hill International edition, Seventh edition, 2009.
2. Ian Sommerville, Software Engineering, 8th Edition, Pearson Education, 2008.

REFERENCES:
1. Stephan Schach, Software Engineering, Tata McGraw Hill, 2007
2. Pfleeger and Lawrence Software Engineering: Theory and Practice, Pearson Education, second edition, 2001

PTGE8251   ENVIRONMENTAL SCIENCE AND ENGINEERING   L T P C
(Common to Manufacturing, Mechanical, Printing ,Production, Civil, CSE, IT,   3 0 0 3
EEE, Industrial, chemical, & Textile)

OBJECTIVES:
To the study of nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I   ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
    Field study of common plants, insects, birds
    Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II   ENVIRONMENTAL POLLUTION   8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III   NATURAL RESOURCES   10

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

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT   6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.

- Public awareness of environment at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions.
- Development and improvement in standard of living has lead to serious environmental disasters.

TEXT BOOKS:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

REFERENCE BOOKS:

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia',Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press (2005)

PTCS8311   JAVA AND INTERNET PROGRAMMING LABORATORY   L T P C
0 0 3 2

OBJECTIVES:
The student should be made to:
- Understand Object Oriented features of Java.
- Learn about Socket programming and RMI in Java
- Understand Client side scripting and Server side programming
- Learn about Web application development in Java

LIST OF EXPERIMENTS:
1. Java classes and objects
2. Inheritance, Polymorphism
3. Interfaces and Exception Handling, Packages
4. Using InetAddress class
5. Socket Programming in Java
6. RMI
7. Client side scripting using
       XHTML,
       Javascript/DOM
       CSS
8. XML DTD, Parsers, XSLT
9. Programming with AJAX
10. Java Applets, AWT, Swings
11. Server Side programming (implement these modules using any of the server
    side scripting languages like PHP, Servlets, JSP, ASP.NET
       Gathering form data
       Querying the database
       Response generation
       Session management
12. MySQL/JDBC/Oracle
13. Application development
14. Develop applications using Dreamweaver/Flex/SilverLight etc.,

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the student will be able to:
- Implement programs using the Object Oriented features of Java
- Implement socket programming and Client side scripting in Java
- Design a Web application using Java Applets, AWT and Swings
- Develop application using Dreamweaver/Flex/Silver Light etc.
  including use of database connectivity

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS:
Software:
       1. Browser
       2. JDK version 6 update 27
       3. TOMCAT 7.0
       4. MySQL 5.5,
       5. Oracle 11i
       6. Dreamweaver CS5.5
       7. NetBeans IDE 7
       8. XAMPP / WAMP

PTCS8401   **ARTIFICIAL INTELLIGENCE**   **L T P C**
                                                                                   3 0 0 3

OBJECTIVES:
- To understand the role of intelligent agents
- To learn uninformed and informed search strategies
- To understand the concepts behind constraint satisfaction
- To learn to represent knowledge effectively using propositional logic and predicate logic
- To learn various reasoning paradigms
- To understand the role of reasoning in machine learning

UNIT I   INTRODUCTION   9
Introduction – Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI problems

UNIT II   PROBLEM SOLVING METHODS   9
Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing -Optimal Decisions in Games -Alpha--Beta Pruning -Stochastic Games

UNIT III   KNOWLEDGE REPRESENTATION   9
First Order Predicate Logic – Prolog Programming - Unification -Forward Chaining -Backward Chaining - Resolution –Knowledge Representation - Ontological Engineering - Categories and Objects –Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV   MACHINE LEARNING   9
Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees - Regression and Classification with Linear Models - Artificial Neural Networks - Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

UNIT V   APPLICATIONS   9
AI applications – Language Models - Information Retrieval - Information Extraction – Natural Language Processing - Machine Translation – Speech recognition – Robot – Hardware – Perception – Planning – Moving

                                                                  TOTAL: 45 PERIODS
OUTCOMES:
- To differentiate between various intelligent agents
- To solve problems involving informed and uninformed search strategies
- To represent natural language sentences using predicate logic and propositional logic
- To differentiate supervised learning from unsupervised learning
- To identify real world applications of AI

TEXT BOOKS:
1. S. Russell and P. Norvig, <u>Artificial Intelligence: A Modern Approach</u>, Prentice Hall, 3rd Edition, 2009
2. Bratko, I., <u>Prolog Programming for Artificial Intelligence (International Computer Science Series)</u>, Addison-Wesley Educational Publishers Inc; 4th edition, 2011.
3. <u>David L. Poole</u>, <u>Alan K. Mackworth</u>, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

REFERENCES:
1. M. Tim Jones, Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc; 1 edition, 2008
2. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009
3. Nils J. Nilsson, the Quest for Artificial Intelligence, Cambridge University Press, 2009.
4. William F. Clocksin, and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.

PTCS8402   **COMPUTER GRAPHICS AND MULTIMEDIA**   **L T P C**
                                                                                           3 0 0 3

OBJECTIVES:
- To learn the fundamentals of graphics and multimedia
- To know the concepts of 2D and 3D graphics programming
- To acquire skills related to multimedia compression and animation
- To learn to handle multimedia objects

UNIT I   2D PRIMITIVES   9
Elements of pictures created in computer graphics – Graphics input primitives and devices – OpenGL basic Graphics primitives – Output primitives – Line, Circle and Ellipse drawing algorithms – Attributes of output primitives.

UNIT II   2D GEOMETRIC TRANSFORMATIONS   9
2D Viewing – Window-Viewport Transformation - Two dimensional Geometric transformations – Line, Polygon, Curve and Text clipping algorithms

UNIT III   3D CONCEPTS   9
projections - Three dimensional object representation – Polygons, Curved lines, Splines, Quadric Surfaces - Visualization of data sets - 3D affine transformations – Viewing – Visible surface identification – Color Models, 3D Transformations in open GL

UNIT IV   MULTIMEDIA BASICS   9
Introduction and definitions – applications – elements – Animations – Compression – Types of Compressions: Lossless – Lossy – Video compression – Image Compression – Audio compression – Data and file format – Multimedia data structures: KD Trees –R trees.

UNIT V   MULTIMEDIA AUTHORING AND APPLICATIONS   9
Creating interactive multimedia – Multimedia Authoring Systems – Applications – Video On demand – Virtual Reality – Augmented Reality – Content based retrieval in digital libraries.
                                                                                  TOTAL: 45 PERIODS
OUTCOMES:
- To develop, design and implement two and three dimensional graphical structures
- To differentiate lossy and lossless compressions
- To develop programming assignments related to animation
- To create interactive multimedia

TEXT BOOKS:
1. Donald D. Hearn, M. Pauline Baker and Warren Carithers, "Computer Graphics with OpenGL", Fourth Edition, Pearson Education, 2010.
2. Ze-Nian Li and Mark S.Drew, "Fundamentals of Multimedia", First Edition, Pearson Education, 2007.

REFERENCE BOOKS:
1. F.S.Hill, "Computer Graphics using OPENGL", Second edition, Pearson Education, 2003.
2. Prabhat K Andleigh, Kiran Thakrar, "Multimedia systems design", First Edition, PHI, 2007.

PTCS8403   **DATA COMMUNICATION AND COMPUTER NETWORKS**   **L T P C**
                                                                3 0 0 3

OBJECTIVES:
- To appreciate the top-down and bottom-up view of computer network architecture
- To know the functionality of each layer in computer networks
- To get introduced to various protocols at every layer
- To learn concepts related to network addressing
- To learn the use of hardware in data communication

UNIT I   APPLICATION LAYER   9
Network Architecture – Layers - HTTP – DNS – E-Mail (SMTP, MIME, POP3, IMAP, Web Mail), FTP, Telnet - SNMP.

UNIT II   TRANSPORT LAYER   9
User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Flow Control – Congestion Control – Queuing - Discipline Introduction to Quality of services (QOS).

UNIT III   NETWORK LAYER   9
Circuit Switching - Packet Switching Virtual Circuit Switching – IP – ARP – DHCP – ICMP – Routing – RIP – OSPF – Subnetting – CIDR – Interdomain Routing – BGP – IPV6 Basic Features – Inter Domain Multicast – Congestion Avoidance in Network Layer.

UNIT IV   DATA LINK LAYER   9
Channel access on links – SDMA – TDMA – FDMA – CDMA – Hybrid Multiple Access Techniques – Issues in the Data Link Layer – Framing - Error correction and detection – Link Level Flow Control – Medium Access – Ethernet – Token Ring – FDDI – Wireless LAN – Bridges and Switches.

UNIT V   DATA COMMUNICATIONS   9
Data Transmission – Transmission Media – Signal Encoding Techniques – Multiplexing – Spread Spectrum

TOTAL: 45 PERIODS

OUTCOMES:
- To write programs for data communication in application layer
- To differentiate between the functional view of TCP and UDP
- To evaluate the protocols in network layer from QoS perspective
- To outline the protocols and topologies in data link layer
- To identify the use of various transmission media

TEXT BOOKS:
1. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Third Edition, Pearson Education, 2006.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2011.
3. William Stallings, "Data and Computer Communications", Eighth Edition, Pearson Education, 2011.

REFERENCES:
1. Nader F. Mir, "Computer and Communication Networks", First Edition, Pearson Education, 2007.
2. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach ", McGraw Hill Publisher, 2011.
3. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

PTCS8451	OBJECT ORIENTED ANALYSIS AND DESIGN	L T P C
	(Common to CSE & IT branches)	3 0 0 3

OBJECTIVES:
- To understand the fundamentals of objects and their modeling
- To differentiate unified process from other approaches
- To emphasize on modeling based software design
- To familiarize with the modeling languages
- To reinforce software design with design patterns

UNIT I   OOAD BASICS   10
Introduction – Overview of object oriented system development – Object basics-The Unified Process – Modeling concepts – Modeling as a design technique – Analysis and modeling – UML diagrams – Use case Modeling – Class modeling – State modeling – Interaction Modeling

UNIT II   REQUIREMENTS & MORE MODELING   7
Object Constraint Language - Inception – Evolutionary Requirements– Domain Models – System Sequence Diagrams – Operation Contracts

UNIT III   DESIGN AND PRINCIPLES OF DESIGN   10
Requirements to Design –Design Patterns – Logical Architecture – Package diagram – Design patterns – Model, View, Control pattern – Detailed design – Object design with GRASP pattern – Detailed class diagram with Visibility.

UNIT IV   MAPPING TO CODE   8
Mapping designs to code – Test Driven development and refactoring – UML Tools and UML as blueprint.

UNIT V   MORE PATTERNS   10
More Patterns – Analysis update – Objects with responsibilities – Applying design patterns – Architectural Analysis – Logical Architecture Refinement – Package Design –Persistence framework with patterns.

TOTAL : 45 PERIODS

OUTCOMES:
- To express software design with UML diagrams
- To analyse the communication of software modules using interaction diagrams
- To identify and map basic software requirements in UML modeling
- To be capable of transforming UML based software design into pattern based design framework using design patterns
- To explain the purpose of applying particular design pattern to a specific module
- To outline and analyse the areas of design pattern correspondence with code

TEXT BOOKS:
1. Michael Blaha and James Rumbaugh, "Object-oriented modeling and design with UML", Prentice-Hall of India, 2005.
2. Craig Larman. "Applying UML and Patterns – An introduction to Object-Oriented Analysis and Design and Iterative Development", 3rd ed, Pearson Education, 2005.

REFERENCES:

1. Ali Bahrami, "Object Oriented Systems Development", McGraw-Hill, 1999.
2. Booch, Grady. Object Oriented Analysis and Design. 2nd ed. Pearson Education 2000.
3. Fowler, Martin. UML Distilled. 3rd ed. Pearson Education. 2004.
4. Lunn, Ken. Software development with UML. Palgrave Macmillan. 2003.
5. O'Docherty, Mike. Object-Oriented Analysis & Design. Wiley. 2005.

PTCS8411   **CASE TOOLS LABORATORY**   **L T P C**
                                                                      0 0 3 2

OBJECTIVES:
The student should be made to:
- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques

LIST OF EXPERIMENTS:
1. Study of case tools such as rational rose or equivalent tools
2. Requirements
   - Implementation of requirements engineering activities such as elicitation, validation, management using case tools
3. Analysis and design
   - Implementation of analysis and design using case tools.
4. Study and usage of software project management tools such cost estimates and scheduling
5. Documentation generators - Study and practice of Documentation generators.
6. Data modeling using automated tools.
7. Practice reverse engineering and re engineering using tools.
8. Exposure towards test plan generators, test case generators, test coverage and software metrics.
9. Meta modeling and software life cycle management.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Design and implement projects using OO concepts.
- Use the UML analysis and design diagrams.
- Apply appropriate design patterns.
- Create code from design.
- Compare and contrast various testing techniques

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
1. Case tools such as rational rose or equivalent tools. (30 user license).
2. Any Project management tools such as JxProject (freeware).
3. 1 server + 32 PCs (P4 or higher version with atleast 2 GB RAM).

PTCS8501   **MOBILE AND PERVASIVE COMPUTING**   **L T P C**
                                                                                     3 0 0 3

OBJECTIVES:
- To study the details of lower layers of mobile architectures
- To learn to develop applications for various mobile OS
- To learn the concepts and protocols behind wireless networks

UNIT I   PERVASIVE COMPUTING   9
Basics and vision – Architecture and Applications requirements – Smart devices and operating systems , secure services – Smart mobiles, cards and device networks.

UNIT II   MOBILE APPLICATIONS   9
History – Mobile Ecosystem – Designing for context – Mobile strategy – Mobile applications – Information Architecture – Design – Mobile Web apps vs Native Apps – Adapting to devices – Supporting devices – Application development on Android and iPhone.

UNIT III   MEDIUM ACCESS AND TELECOMMUNICATIONS   9
Frequencies – Signals – Antennas – Signal propagation – Media Access Control: Motivation, SDMA, FDMA, TDMA, CDMA – GSM: Mobile services, System architecture, Protocols, Localization and calling, Handover – GPRS.

UNIT IV   WIRELESS NETWORKS   9
Infrared vs radio transmission – Infrastructure and ad hoc networks – WLAN, EEE 802.11 standards protocols. Piconet- Bluetooth-architecture and services. Wireless Broadband networks and satellites networks.

UNIT V   MOBILE NETWORK AND TRANSPORT LAYERS   9
Mobile IP – DHCP – Routings in Mobile ad hoc networks – TCP improvements – TCP over 2.5/3G.

                                                                        TOTAL: 45 PERIODS

OUTCOMES:
- To explain the features of smart mobiles and other smart devices
- To develop applications for Android and iOS
- To explain protocols related to routing in mobile networks

TEXT BOOKS:
1. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, 2009.
2. Brian Fling, "Mobile Design and Development", O'Reily, 2009.
3. Jochen Schiller, "Mobile Communications", 2nd ed., Pearson Education, 2003.

REFERENCES:
1. Zigurd Mednieks, Laird Dornin, G,Blake Meike and Masumi Nakamura "Programming Android", O'Reilly, 2011.
2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
3. Alasdair Allan, "iPhone Programming", O'Reilly, 2010.
4. Wei-Meng Lee, "Beginning iPhone SDK Progrmming with Objective-C", Wrox Wiley, 2010.
5. Asoke K Talukder, Hasan Ahmed, Roop R Yavagal, "Mobile Computing", 2nd ed, Tata McGraw Hill, 2010.
6. Pei Zheng, Lionel M. Ni, "Smart Phone & Next Generation Mobile Computing", Morgan Kaufmann, 2006.
7. Frank Adelstein, Sandeep KS Gupta, Golden Richard, "Fundamentals of Mobile and Pervasive Computing", Tata McGraw-Hill, 2005.

8. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
9. Jochen Burkhardt et al, Pervasive Computing: Technology and Architecture of Mobile Internet Applications, Pearson Education, 2002.

PTCS8502   **SECURITY IN COMPUTING**   **L T P C**
                                                                      3 0 0 3

OBJECTIVES:
- To understand the basics of cryptography
- To learn to find the vulnerabilities in programs
- To know the different kinds of security threats in networks, databases and their solutions
- To learn about models and standards of security

UNIT I   ELEMENTARY CRYPTOGRAPHY   9
Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures – Certificates

UNIT II   PROGRAM SECURITY   9
Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Top 10 Flaws – Common Weakness Enumeration Top 25 Most Dangerous Software Errors

UNIT III   SECURITY IN NETWORKS   9
Threats in networks – Encryption – Virtual Private Networks – PKI – SSH – SSL – IPSec – Content Integrity – Access Controls – Wireless Security – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

UNIT IV   SECURITY IN DATABASES   9
Security requirements of database systems – Reliability and Integrity in databases – Two Phase Update – Redundancy/Internal Consistency – Recovery – Concurrency/Consistency – Monitors – Sensitive Data – Types of disclosures – Inference.

UNIT V   SECURITY MODELS AND STANDARDS   9
Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.

TOTAL: 45 PERIODS

OUTCOMES:
- To write programs on public key encryption
- To differentiate malicious and non-malicious code
- To list and explain various type of threats in networks
- To write secured transactions in databases
- To explain various standards related to security models

TEXT BOOKS:
1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.

2. Matt Bishop, "Introduction to Computer Security", Addison-Wesley, 2004.
3. Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.

REFERENCES:
1. William Stallings, "Cryptography and Network Security : Principles and Practices", Fifth Edition, Prentice Hall, 2010.
2. Michael Howard, David LeBlanc, John Viega, "24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them", First Edition, Mc Graw Hill Osborne Media, 2009.
3. Matt Bishop, "Computer Security: Art and Science", First Edition, Addison-Wesley, 2002.
4. https://www.owasp.org/index.php/Top_10_2010
5. https://www.pcisecuritystandards.org/security_standards/pci_dss.shtml
6. http://cwe.mitre.org/top25/index.html

PTCS8511   **MOBILE APPLICATION DEVELOPMENT LABORATORY**   **L T P C**
                                                                         0 0 3 2

OBJECTIVES:
The student should be made to:
- Understand the basics of Mobile application development
- Be exposed to launching services in a mobile phone and launching Web Portal
- Familiar with application using android and iPhone SDK frame work

LIST OF EXPERIMENTS:
1. General Form Design
2. Mobile browser based interactive applications
3. Applications using controls
4. Mobile networking applications (SMS/Email)
5. Applications involving data retrieval
6. Launching services in a mobile phone
7. Web portal development
8. Applications using Android SDK framework (like interactive applications, applications that make use of accelerometer sensor, video applications)
9. Applications that use the iPhone SDK framework
10. Testing the applications using emulators

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the student will be able to:
- Design Mobile Networking application using basic facilities
- Launch services on Mobile Phone that involves data retrieval
- Design and development a Web Portal
- Compare and Contrast Android SDK and i Phone Frame Works for different types of application and testing these applications using Emulators

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
1. JDK environment
2. J2ME
3. Sun Java Wireless Toolkit
4. Android SDK
5. iPhone SDK

PTCS8601   **DATA WAREHOUSING AND DATA MINING**   **L T P C**
                                                                       3 0 0 3

OBJECTIVES:
- To evolve multidimensional intelligent model from a typical system
- To examine ways for representing multi dimensional data for a data warehouse
- To discover the knowledge imbibed in the high dimensional system
- To study algorithms for finding the hidden interesting patterns in data
- To study the performance of various mining techniques on complex data objects.

UNIT I   INTRODUCTION TO DATA WAREHOUSING   8
Evolution of Decision Support Systems- Data warehousing Components –Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations.

UNIT II   DATA WAREHOUSE PROCESS AND ARCHITECTURE   9
Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses.Data warehouse implementation , tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS

UNIT III   INTRODUCTION TO DATA MINING   9
Data mining-KDD versus datamining, Stages of the Data Mining Process-task premitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns- association-correlation

UNIT IV   CLASSIFICATION AND CLUSTERING   10
Decision Tree Induction - Bayesian Classification – Rule Based Classification –Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods - Clustering techniques – , Partitioning methods- k-means- Hierarchical Methods - distance-based agglomerative and divisible clustering, Density-Based Methods – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis

UNIT V   APPLICATIONS   9
Mining complex data objects, Spatial databases, temporal databases, Multimedia databases, Time series and Sequence data; Text Mining –Graph mining-web mining-Application and trends in data mining
                                                                 TOTAL: 45 PERIODS

OUTCOMES:
- To build a data warehouse for a real-world system
- To identify the necessity for database tuning in data warehouses
- To develop programs demonstrating dimensionality reduction
- To write programs for classification and clustering
- To develop applications related to web data mining

TEXT BOOKS:
1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition2011, ISBN: 1558604898.
2. Alex Berson and Stephen J. Smith, " Data Warehousing, Data Mining & OLAP", Tata Mc Graw Hill Edition, Tenth Reprint 2007.
3. G. K. Gupta, "Introduction to Data Min Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.

REFERENCES:
1. Mehmed kantardzic,"Datamining concepts,models,methods, and algorithms", Wiley Interscience, 2003.
2. Ian Witten, Eibe Frank, Data Mining; Practical Machine Learning Tools and Techniques, third edition, Morgan Kaufmann, 2011.
3. George M Marakas, Modern Data Warehousing, Mining and Visualization, Prentice Hall, 2003.

PTCS8602	SERVICE ORIENTED ARCHITECTURE	L T P C
		3 0 0 3

OBJECTIVES:
- To gain understanding of the basic principles of service orientation, service oriented analysis techniques, technology underlying the service design
- To learn the advanced concepts such as service composition, orchestration and Choreography, and various WS-* specification standards

UNIT I   FUNDAMENTALS OF SOA   9
Introduction-Defining SOA-Evolution of SOA-Service Oriented Enterprise-Comparing SOA to client-server and distributed internet architectures-Basic SOA Architecture-concepts-Key Service characteristics-Technical Benefits-Business Benefits.

UNIT II   COMBINING SOA AND WEB SERVICES   9
Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns-Web Service Platform-Service Contract-Service Level Data Model-Service Discovery-Service Level   Security-Service Level Interaction Patterns-Atomic and Composite Services-Service Enabling Legacy System-Enterprise Service Bus Pattern.

UNIT III   MULTI CHANNEL ACCESS AND WEB SERVICES COMPOSITION   9
SOA for Multi-Channel Access-Business Benefits-Tiers-Business Process Management-Web Service Composition-BPEL-RESTFUL Services-comparison of BPEL and RESTFUL Services.

UNIT IV   JAVA WEB SERVICES   9
SOA support in J2EE – Java API for XML-based web services(JAX-WS)-Java Architecture for XML binding (JAXB) – Java API for XML Registries(JAXR)-Java API for XML based RPC (JAX-RPC)- Web Services Interoperability-SOA support in .NET – ASP.NET web services – Case Studies- Web Services Enhancements (WSE)

UNIT V   WEB SERVICES SECURITY AND TRANSACTION   9
Meta Data Management-Advanced Messaging- Addressing – Reliable Messaging– Policies-WS-Policy– Security- WS-Security–Notification and Eventing-Transaction Management

TOTAL: 45 PERIODS

OUTCOMES:
- To outline the concepts of SOA
- To develop a web service in Java
- To implement web security

TEXT BOOKS:
1. Eric Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education, 2005.
2. JamesMcGovern,Sameer Tyagi,Michael E Stevens,Sunil Mathew,"Java Web Services Architecture",Elsevier,2003.

REFERENCES:
1. Thomas Erl, "Service Oriented Architecture",Pearson Education,2005
2. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education, 2005.
3. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILLY, First Edition, 2006.
4. Frank Cohen, "FastSOA",Elsevier,2007.
5. Jeff Davies, "The Definitive Guide to SOA",Apress,2007

PTCS8611   **SOFTWARE DEVELOPMENT LABORATORY**   **L T P C**
                                                          0 0 3 2

OBJECTIVES:
The student should be made to:
- Understand and apply software Engineering practices that are followed in Software Industries
- Develop a software package in any application.

Develop a software package in any application relevant to any area of study of your curriculum by applying the Software Engineering Practices generally done by software industries, which are
1. Identification of Use cases for each application system and SRS preparation.
2. Identification of reusable Components/Frameworks from open source and customizing them for each application.
3. Coding/Customizing/Wrapping for components/subsystems.
4. Testing – Scenario testing and test case preparation for each components/subsystems
5. Integration of subsystems and Testing
6. Simulation of datasets and load testing to analyze performance of the system.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course, the student will be able to:
- Develop a software package in any application by following the procedural steps namely Identification, Coding, Testing, Integration and Simulation .

PTCS8701   **CLOUD COMPUTING AND SERVICES**   **L T P C**
                                                                                    3 0 0 3

OBJECTIVES
- To understand the current trend and basics of cloud computing.
- To differentiate between various service types: software, platform and infrastructure
- To understand the collaboration of cloud services.
- To expose various ways to collaborate the cloud service online.
- To familiarize with technologies for cloud virtualization
- To learn the standards behind cloud services

UNIT I   INTRODUCTION   9
Cloud-definition, benefits, usage scenarios, History of Cloud Computing - Cloud Architecture -
Types of Clouds - Business models around Clouds – Major Players in Cloud Computing - issues
in Clouds - Eucalyptus - Nimbus - Open Nebula, Cloud Sim.

UNIT II   CLOUD SERVICES   9
Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a
Service - Database as a Service - Monitoring as a Service –Communication as services. Service
providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT III   COLLABORATING USING CLOUD SERVICES   9
Email Communication over the Cloud - CRM Management - Project Management-Event
Management - Task Management – Calendar - Schedules - Word Processing – Presentation –
Spreadsheet - Databases – Desktop - Social Networks and Groupware.

UNIT IV   VIRTUALIZATION FOR CLOUD   9
Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vm,
Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary
translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

UNIT V   SECURITY, STANDARDS AND APPLICATIONS   9
Security in Clouds: Cloud security challenges – Software as a Service Security, Common
Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards
for application Developers – Standards for Messaging – Standards for Security, End user access
to cloud computing, Mobile Internet devices and the cloud.

                                                                 TOTAL: 45 PERIODS
OUTCOMES
- To be able to collaborate the cloud services to any device.
- To explore the online applications of cloud services.
- To implement cloud computing for the corporation.
- To design various applications by integrating the cloud services

TEXT BOOKS:
1. John Rittinghouse & James Ransome, Cloud Computing, Implementation, Management and
   Strategy, CRC Press, 2010.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work
   and Collaborate Que Publishing, August 2008.
3. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.

REFERENCES:
1. David E.Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, Cloud Computing : A Practical Approach, Tata McGraw-Hill 2010.
4. Haley Beard, Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.
5. G.J.Popek, R.P. Goldberg, Formal requirements for virtualizable third generation Architectures, Communications of the ACM, No.7 Vol.17, July 1974.

| PTMG8551 | PRINCIPLES OF MANAGEMENT | L | T | P | C |
| | (Common to ECE,CSE, Civil , Industrial & EEE branches) | 3 | 0 | 0 | 3 |

AIM:
To learn the different principles and techniques of management in planning, organizing, directing and controlling.

OBJECTIVES
- To study the Evolution of Management
- To study the functions and principles of management
- To learn the application of the principles in an organization

UNIT I   INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS   9
Definition of Management –Science or Art – Manager Vs Entrepreneur- types of managers- managerial roles and skills – Evolution of Management –Scientific, human relations , system and contingency approaches– Types of Business organization- Sole proprietorship, partnership, company-public and private sector enterprises- Organization culture and Environment – Current trends and issues in Management.

UNIT II   PLANNING   9
Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III   ORGANISING   9
Nature and purpose – Formal and informal organization – organization chart–organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization –Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV   DIRECTING   9
Foundations of individual and group behaviour– motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V   CONTROLLING   9

System and process of controlling –budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:
1. Stephen P. Robbins & Mary Coulter, " Management", Prentice Hall (India)Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:
1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999

PTCS8001   **.NET AND C# PROGRAMMING**   **L T P C**
                                                                                     3 0 0 3

OBJECTIVES:
- To understand the concept of .NET framework
- To study the different techniques of security
- To get introduced to web services with ASP.NET
- To explore window based applications

UNIT I   C# LANGUAGE BASICS   9

C# and the .NET framework - C# basics - Objects and types - Inheritance - Arrays - Operators and casts – Indexes

UNIT II   C# ADVANCED FEATURES   9

Delegates and events - Strings and regular expressions - Generics - Collections - Memory management and pointers - Errors and exceptions

UNIT III   BASE CLASS LIBRARIES AND DATA MANIPULATION   9

Tracing and events - Threading and synchronization - .Net security - Localization - Manipulating XML - Managing the file system - Basic network programming

UNIT IV   DATABASE AND WEB SERVICES   9

Window based applications - Data access with .NET - basics of ASP .NET - Introduction to web services

UNIT V   .NET FRAMEWORK   9

Architecture - Assemblies - Shared assemblies - CLR hosting - Appdomains – Reflection

TOTAL: 45 PERIODS

OUTCOMES:
- To write programs using basic and advanced features of C#
- To write programs for threading and synchronization
- To develop web based applications on .NET
- To explain the concepts related to reflection

TEXT BOOK:
1. Christian Nagel et al. "Professional C# 2005 with .NET 3.0", Wiley India, 2007.

REFERENCE BOOKS:
1. Ian Gariffiths, Mathew Adams, Jesse Liberty, "Programming C# 4.0", O'Reilly,Fourth Edition, 2010.
2. Andrew Troelson, "Pro C# with .NET 3.0", Apress, 2007.
3. Kevin Hoffman, "Microsoft Visual C# 2005", Pearson Education, 2006.
4. S.Thamarai Selvi, R. Murugesan, "A Text Book on C#", Pearson Education, 2003.

PTCS8002　　　　　　　**ADHOC AND SENSOR NETWORKS**　　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3 0 0 3

OBJECTIVES:
- To study the protocols and the functionalities of ad hoc networks
- To understand the various applications developed based on ad hoc networking
- To know about the sensor networks
- To appreciate the challenges in establishing infrastructure for sensor networks and managing databases

UNIT I　　　INTRODUCTION AND MAC PROTOCOLS　　　　　　　　　　9
Cellular and Ad hoc Networks - Issues in Ad hoc Networks - Design Issues and Design Goals of MAC protocol for Ad hoc Networks - Classification of MAC protocols - Contention Based Protocols - Reservation and Scheduling Mechanisms - Other Protocols.

UNIT II　　　ROUTING PROTOCOLS　　　　　　　　　　　　　　　　9
Design Issues and Classifications of unicast and multicast Routing Protocols - Proactive, Reactive and Hybrid routing protocol – Tree based and Mesh based multicast protocols, Energy Efficient and QoS guaranteed multicast protocols.

UNIT III　　　TRANSPORT LAYER AND SECURITY ISSUES　　　　　　　9
Design Issues, Design Goals and Classifications of Transport layer protocols - TCP over Ad Hoc – Security in Ad hoc Networks - Network Security Requirements - Network Security Attacks - Key Management - Secure Routing in Ad hoc Networks.

UNIT IV　　　SENSOR NETWORKS AND NETWORKING SENSORS　　　　9
Unique Constraints and Challenges – Advantages and Applications – Collaborative Processing – Key Definitions – Localization and Tracking – Networking Sensors – MAC – Geographic, Energy Aware and Attribute based Routing.

UNIT V　　　INFRASTRUCTURE ESTABLISHMENT AND NETWORK DATABASE　　9
Topology Control – Clustering – Time Synchronization – Localization and Localization Services – Task Driven Sensing – Roles of Sensor Nodes and Utilities – Network Database

TOTAL: 45 PERIODS

OUTCOMES:
- To list the design issues in Ad-hoc networks
- To differentiate the working of various routing protocols
- To identify the challenges in sensor networks
- To outline issues related to synchronization and localization
- To evaluate the performance of protocols from QoS perspective

TEXT BOOKS:
1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2nd Edition, 2005.
2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks – An Information Processing Approach", Elsevier Publications, 2004.

REFERENCES:
1. C.K.Toh, "Ad hoc Mobile Wireless Networks – Protocols and Systems", Pearson Education, 1st Edition, 2007.
2. George Aggelou, "Mobile Ad hoc Networks – From Wireless LANs to 4G Networks, Tata McGraw Hill, 2009.
3. Holger Karl and Andreas Willing, "Protocols and Architectures for Wireless Sensor Networks" Wiley Publications, 2005.

PTCS8003   **ADVANCED TOPICS ON DATABASES**   **L T P C**
                                                             3 0 0 3

OBJECTIVES:
- To know advanced concepts in databases in large scale analytics
- to learn concepts behind parallel, distributed, active, spatial, temporal and object databases
- to learn reasoning and query processing
- to understand the challenges in designing multimedia databases
.

UNIT I   **PARALLEL AND DISTRIBUTED DATABASES**   **9**
Inter and Intra Query Parallelism – Architecture – Query evaluation – Optimization – Distributed Architecture – Storage – Catalog Management – Query Processing - Transactions – Recovery - Large-scale Data Analytics in the Internet Context - MapReduce Paradigm - run-time system for supporting scalable and fault-tolerant execution - paradigms: Pig Latin and Hive and parallel databases versus Map Reduce

UNIT II   **ACTIVE DATABASES**   **9**
Syntax and Sematics (Starburst, Oracle, DB2) – Taxonomy – Applications – Integrity Management – Workflow Management – Business Rules – Design Principles – Properties – Rule Modularization – Rule Debugging – IDEA methodology – Open Problems.

UNIT III   **TEMPORAL   AND OBJECT DATABASES**   **9**
Overview – Data types – Associating Facts – Temporal Query Language – TSQL2 – Time Ontology – Language Constructs – Architecture – Temporal Support – Object Database and Change Management – Change of Schema – Implementing Database Updates in O_2 – Benchmark Database Updates – Performance Evaluation.

UNIT IV COMPLEX QUERIES AND REASONING 9

Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Datalog – Fixpoint semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues.

UNIT V SPATIAL, TEXT AND MULTIMEDIA DATABASES 9

Traditional Indexing Methods (Secondary Keys, Spatial Access Methods) – Text Retrieval – Multimedia Indexing – 1D Time Series – 2d Color images – Subpattern Matching – Open Issues – Uncertainties

TOTAL: 45 PERIODS

OUTCOMES:
- to write programs involving query optimization
- to write programs related to large scale data processing
- to use MapReduce in data analytics
- to evaluate the performance of temporal and spatial databases
- to write suitable indexing programs for multimedia databases

REFERENCES:
1. Ramakrishnan, Gehrke, "Database Management System", Tata Mc Graw Hill Publications, Third Edition.
2. Carlo Zaniolo, Stefano Ceri "Advanced Database Systems", Morgan Kauffmann Publishers.
3. VLDB Journal.

FURTHER READING:
- http://video.google.com
- http://www.blinkvid.com/video
- http://www.learnerstv.com/course.php?cat=Computers
- http://www.crazyengineers.com/forum

PTCS8004	BIO INFORMATICS TECHNOLOGIES	L T P C
		3 0 0 3

OBJECTIVES:
- To understand basic concepts of molecular biology and genetics
- To learn the concepts of computer science that relate to problems in biological sciences
- To learn to use computer as a tool for biomedical research
- To get introduced to important functional relationships from gene data.

UNIT I INTRODUCTION 9

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT II DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS 9

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics

UNIT III MODELING FOR BIOINFORMATICS 9

Hidden markov modeling for biological data analysis – Sequence identification –Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

UNIT IV PATTERN MATCHING AND VISUALIZATION 9
Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT V MICROARRAY ANALYSIS 9
Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark - Tradeoffs

TOTAL: 45 PERIODS

OUTCOMES:
- To apply data warehousing and data mining concepts in bioinformatics
- To develop models for biological data
- To write programs using HMM for bioinformatics
- To write programs using pattern matching and visualization
- To apply microarray technology for genomic expression study

TEXT BOOKS:
1. Yi-Ping Phoebe Chen (Ed), "BioInformatics Technologies", First Indian Reprint, Springer Verlag, 2007.
2. Zoe lacroix and Terence Critchlow, "BioInformatics – Managing Scientific data", First Indian Reprint, Elsevier, 2004

REFERENCES:
1. Zoe Lacroix and Terence Critchlow, "Bioinformatics – Managing Scientific Data", First Edition, Elsevier, 2004
2. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
3. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005

PTCS8005 **COMPUTATIONAL INTELLIGENCE** **L T P C**
                                                    3 0 0 3

OBJECTIVES:
- To examine work at the frontiers of research in computing where ideas from biology are inspirations to build truly intelligent computer systems
- To analyse the dependencies among biology, complexity, computer science, informatics, cognitive science, robotics, and cybernetics
- To introduce concepts, models, algorithms, and tools for development of intelligent systems
- To create an understanding of the fundamental Computational Intelligence models
- To explore the theory and applications of two classes of system inspired by biology: neural networks and evolutionary computation
- To learn to apply Computational Intelligence techniques to classification, pattern recognition, prediction, rule extraction, and optimization problems.

UNIT I   THEORETICAL FOUNDATIONS   9

Data mining: fundamentals – data reduction - Decision tree algorithms - Association rules, Clustering: K-means, fuzzy c-means, hierarchical, probabilistic clustering methods - Rough set theory: definition – rule induction – feature selection - rough sets in data mining

UNIT II   LEARNING   9

Bayes Optimal Classifiers – Gibbs Algorithms –Supervised Learning – Unsupervised Learning – Reinforcement Learning – Adaptive Learning EM Algorithm – Probability Learning - K- Nearest Neighbour Learning – Regression – Case Based Learning – collaborative learning - cognitive approach to learning and prediction

UNIT III   EVOLUTIONARY COMPUTING   9

Neural Networks – Back propagation Networks – Hopfield Neural Networks – Radial Basis Function Networks – Learning Vector Quantisation - Artificial Neural Networks
Fuzzy Classifiers – Fuzzy Cognitive Maps – Collective Intelligence - Swarm Intelligence – Ant routing – Adaptivity and self-organisation – quantitative emergence and control - Self-Organising Feature Maps

UNIT IV   ARTIFICIAL IMMUNE SYSTEMS   9

Scope – Framework – Algorithms – Network Models – Cognition and Immune Systems – Survey of Immune Systems, AI Hybrid systems: Case based reasoning – Classifier systems – Fuzzy systems – DNA computing – Case studies: Autonomous Navigation – Network Security – Job-shop scheduling

UNIT V   ADVANCED TOPICS   9

Ant Colony Optimization – Particle Swarm optimization – Artificial Life Systems - Swarms in business intelligence - Human-swarm interaction - Behavioral Intelligence – flock based collaboration – fusion, Robotic Swarms – population diversity - Self-organising robots – self-reconfigurable robots – Robot Coordination - Quantum computing – quantum algorithms – firefly, glow worm - applications

TOTAL: 45 PERIODS

OUTCOMES:
- To write programs involving decision trees and clustering
- To write programs using machine learning
- To differentiate the operation of various type of neural networks
- To develop applications involving ACO and PSO

TEXT BOOKS:
1. S. Sumathi, Surekha Paneerselvam, Computational Intelligence Paradigms: Theory & Applications Using MATLAB, CRC Press, 2009.
2. Russell C. Eberhart and Yuhui Shi,Computational intelligence: concepts to implementations, Morgan Kauffman, 2007.
3. John Fulcher, L. C. Jain, Computational intelligence: a compendium, Studies in computational intelligence, Vol. 115, Springer, 2008.
4. Leandro N. De Castro, Jonathan Timmis, Artificial immune systems: a new computational intelligence approach, Illustrated edition, Springer, 2002.

REFERENCES:
1. Andries P. Engelbrecht, Computational intelligence: an introduction, editon 2, John Wiley and Sons, 2007.

2. Christine L. Mumford, Lakhmi C. Jain, Computational Intelligence: Collaboration, Fusion and Emergence, Intelligence Systems reference library series, Volume 1, Springer, 2009.
3. Cordon, O.; Herrera, F.; Gomide, F.; Hoffmann, F.; Magdalena, L.; , "Ten years of genetic fuzzy systems: current framework and new trends," 9th Joint IFSA World Congress and 20th NAFIPS International Conference , vol.3, pp.1241-1246, 25-28 July 2001

PTCS8006	DATABASE TUNING	L T P C
		3 0 0 3

OBJECTIVES:
- To get the feel of basics of database tuning
- To learn concepts behind database design optimization
- To write procedures involving query planning

UNIT I   SQL TUNING   9
SQL tuning – Execution Plan – Inspection – Optimization – Locking – Joining – Locks – Tuning Recovery subsystem – Operating system consideration – Hardware Tuning.

UNIT II   DESIGN OPTIMIZATION   9
Techniques – Tuning Relational Systems – Normalization – Tuning Denormalization – Clustering two tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client server mechanism – Bulk Loading data – Accessing Multiple Databases.

UNIT III   PERFORMANCE TUNING   9
Approach – Performance Tuning Vs Relational database Applications – Performance Monitoring – Reasons – Types – Strategy – Performance monitoring Tools and strategies.

UNIT IV   TROUBLESHOOTING   9
Query plan explainers – Performance Monitors – Event Monitors – Finding Suspicious Queries – Analyzing Query Access Plan – Profiling a Query Execution – DBMS Subsystems.

UNIT V   CASE STUDIES   9
Monitoring and Tuning Activities – Benchmarking results of Oracle SQL* Forms – Oracle 11g – Informix.

TOTAL: 45 PERIODS

OUTCOMES:
- To design databases involving normalization
- To write optimized code for accessing multiple databases
- To use tuning tools for different database operations
- To troubleshoot databases
- To use benchmark databases for demonstrating concepts behind database tuning

TEXT BOOKS:
1. Dennis Shasha and Philippe Bonnet "Database Tuning, Principles, Experiments, and Troubleshooting Techniques", Elsevier Reprint 2005.
2. Peter Gulutzan & Trudy Pelzer, "SQL Performance Tuning", Addison-Wesley, 1st edition, 2002.

PTCS8007   **E-LEARNING TECHNIQUES**   **L T P C**
                                                                             3 0 0 3

OBJECTIVES:
- To learn the fundamentals of E-learning framework and lifecycle
- To know the potential uses of various learning management systems
- To familiarize the principles of E-learning
- To know the issues in designing interactive learning
- To appreciate the challenges and benefits of collaborative learning

UNIT I   INTRODUCTION   9
E-Learning - E-Learning cycle - E-Learning types - challenges and opportunities – cognitive presence –Approaches to design E-Learning - E-Learning framework - 6C framework - E-Learning Tools

UNIT II   E-LEARNING STRATEGY   9
Role of tutor - E-Learning strategy - Blended E-Learning – M-Learning- problem based learning- Enterprise learning- Corporate Learning- Web based Learning - Pod casting -Learning Management systems – Content development process – E-Learning standards- SCORM standard- managing e-learning quality - case studies

UNIT III   PRINCIPLES OF E-LEARNING   9
Philosophy of E-Learning – theory of learning – Applying principles of multimedia - Applying principles of contiguity - Applying principles of modality - Applying principles of redundancy - Applying principles of coherency - Applying principles of personalization- web-based learning communities - knowledge sharing and Knowledge management in e-learning- social networks and social media in e-learning

UNIT IV   DESIGN   9
On line E-Learning technologies – visual communication techniques- Computer-based technologies - Computer-mediated communication (CMC) - Assessment and evaluation- Organizing and designing learning sequences, Characteristics of Interactive Online Learning Media

UNIT V   IMPLEMENTATION   9
Leverages example in E-Learning – collaborative E-Learning- Learner control in E-Learning- guidelines to solve issues in E-Learning – Implementation of an E-Learning Course Content for a complete online course, Research in content retrieval and generation for E-Learning, Role of cloud and semantic Grid in E-Learning

TOTAL: 45 PERIODS

OUTCOMES:
- To analyze and compare different on-line E-Learning tools
- To design course content for a specific subject from different perspectives
- To plan and design the instruction and support level needs of learners of various backgrounds based on different learning methodologies
- To outline the various tasks of a typical online course facilitator
- To design and implement an E-Learning Course Content for a complete online course

TEXT BOOKS:
1. D.Randy Garrison "E-Learning in the 21st century a framework for research and practice", 2nd edition, Taylor and Francis, 2011.
2. Robin Mason, "E-Learning : the key concepts", Routledge, 2007.
3. William Horton, "E-Learning by Design", Pfeiffer Wiley, 2006.
4. John Gardner, Bryn Holems, "E-Learning : Concepts and practice" SAGE Publications, 2006.

REFERENCES:
1. R.C.Clark and R.E.Mayer, "E-Learning and the science of instruction", Pfeiffer Wiley, 2011.
2. Mark J Rosenberg, "E-Learning: strategies for delivering knowledge in the Digital Age", McGraw- Hill, 2001.
3. Kjell E. (Erik) Rudestam , Judith Schoenholtz-Read, "Handbook of Online Learning", Sage Publications Inc., Second Edition, 2009.
4. Topics (Wiley Series on Parallel and Distributed Computing)

PTCS8008　　　　　　　**GRAPH THEORY AND COMBINATORICS**　　　　**L T P C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3 0 0 3

OBJECTIVES:
- To comprehend graphs as modeling and analysis tool
- To introduce various data structures with graph theory
- To learn fundamentals behind principle of counting and combinatorics

UNIT I　　　　INTRODUCTION　　　　　　　　　　　　　　　　　　　　9
Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.

UNIT II　　　　TREES, CONNECTIVITY & PLANARITY　　　　　　　　9
Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.

UNIT III　　　　MATRICES, COLOURING AND DIRECTED GRAPH　　　　8
Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

UNIT IV　　　　PERMUTATIONS & COMBINATIONS　　　　　　　　　9
Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

UNIT V   GENERATING FUNCTIONS   10

Generating functions - Partitions of integers - Exponential generating function - Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions.

TOTAL: 45 PERIODS

OUTCOMES:
- To write programs involving basic graph algorithms
- To write programs for graph coloring
- To differentiate the potential use of directed and undirected graphs
- To outline the concepts of permutations and combinations

TEXT BOOKS:
1. Narsingh Deo, Graph Theory: With Application to Engineering and Computer Science, Prentice Hall of India, 2003.
2. Grimaldi R.P., Discrete and Combinatorial Mathematics: An Applied Introduction, Addison Wesley, 1994.

REFERENCES:
1. Clark J. & Holton D.A., A First Look at Graph Theory, Allied Publishers, 1995.
2. Mott J.L., Kandel A. & Baker T.P., Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India, 1996.
3. Liu C.L., Elements of Discrete Mathematics, McGraw Hill, 1985.
4. Rosen K.H., Discrete Mathematics And Its Applications, McGraw Hil, 2007.

PTCS8009   **GREEN COMPUTING**   L T P C
                                        3 0 0 3

OBJECTIVES:
- To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment
- To learn about energy saving practices
- To understand the impact of e-waste and carbon waste

UNIT I   FUNDAMENTALS   9

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II   GREEN ASSETS AND MODELING   9

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III   GRID FRAMEWORK   9

Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV GREEN COMPLIANCE   9
Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V CASE STUDIES   9
The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – CASE STUDIES – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TOTAL: 45 PERIODS

OUTCOMES:
- To explain the necessity of GreenIT
- To outline methodologies for creating Green Assets and their management
- To appreciate the use of Grid in GreenIT
- To develop case studies related to Environmentally Responsible Business Strategies

TEXT BOOKS:
1. Bhuvan Unhelkar, **"**Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.

REFERENCES:
1. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.
2. John Lamb, "The Greening of IT", Pearson Education, 2009.
3. Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.
4. Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

PTCS8010   **HUMAN COMPUTER INTERACTION**   **L T P C**
                                                               3 0 0 3

OBJECTIVES:
- To determine the necessity and use of computers
- To learn the methodologies for designing interactive systems
- To discover various models used for designing HCI systems

UNIT I DESIGN PROCESS   9
Humans – Information process – Computer – Information Process – Differences and Similarities between them – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms – Designing of Interactive systems – Usability – Paradigm shift – Interaction design basics – Design Process – Scenarios – Users need – Complexity of design

UNIT II   DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS   9

Software Process – Usability engineering – Issue based Information systems – Iterative design practices – Design rules – maximum usability – Principles – Standards and guidelines – design patterns – Programming Tools – Windowing systems – Interaction tool kit – User Interface management system – Evaluation techniques – evaluation design – Evaluating implementations – Observational Methods

UNIT III   MODELS   9

Universal design principles – Multimodal systems – User Support – Presentation and Implementation Issues – types – requirements – approaches – Cognitive model – Hierarchical model – Linguistic model – physical and device models – Socio-technical models – Communication and Collaboration models – Task models – Task analysis and design

UNIT IV   EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI   9

Basic Design structure – Single independent variable – multiple independent variable – factorial design – split-plot design – random errors – experimental procedure – Statistical analysis – T tests – Analysis of Variance test – Regression – Chi-Square test – Survey – Probabilistic sampling – Non-probabilistic sampling – developing survey questions

UNIT V   THEORIES   9

Dialogue notations and design – Dialogue need – dialogue design notations – Graphical – Textual - representing dialogue – formal descriptions – Dialogue analysis – System models – Interaction models – relationship with dialogue – Formalisms – Formal notations – Interstitial behavior – Virtual reality – Modeling rich interaction – Status Event analysis – Properties – Rich contexts – Sensor-based systems – Groupware – Applications – Ubiquitous computing – Virtual reality

TOTAL: 45 PERIODS

OUTCOMES:
- To evaluate the use of interactive systems
- To map software engineering principles with HCI system design
- To outline the methodologies for statistical analysis of HCI
- To design effective HCI for individuals and persons with disabilities
- To develop meaningful user interface

TEXT BOOKS:
1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human-Computer Interaction Wiley, 2010.

REFERENCE:
1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

PTCS8011   INFORMATION RETRIEVAL AND MANAGEMENT   L T P C
                                                                    3 0 0 3
OBJECTIVES:
- To learn the concepts behind IR
- To understand the operation of web search engines
- To learn the algorithms related to classification and clustering in Text Mining

UNIT I   INTRODUCTION   9
Introduction -History of IR- Components of IR - Issues –Open source Search engine
Frameworks, The impact of the web on IR - The role of artificial intelligence (AI) in IR – IR Versus
Web Search - Components of a Search engine- Characterizing the web

UNIT II   INFORMATION RETRIEVAL   9
Boolean and vector-space retrieval models- Term weighting - TF-IDF weighting- cosine similarity
– Preprocessing - Inverted indices - efficient processing with sparse vectors –Language Model
based IR - Probabilistic IR –Latent Semantic Indexing - Relevance feedback and query
expansion

UNIT III   WEB SEARCH ENGINE – INTRODUCTION AND CRAWLING   9
Web search overview, web structure, the user, paid placement, search engine
optimization/spam. Web size measurement - search engine optimization/spam – Web Search
Architectures - crawling - meta-crawlers- Focused Crawling - web indexes –- Near-duplicate
detection - Index Compression - XML retrieval

UNIT IV   WEB SEARCH – LINK ANALYSIS AND SPECIALIZED SEARCH   9
Link Analysis –hubs and authorities - PageRank and HITS algorithms -Searching and Ranking –
Relevance Scoring and ranking for Web – Similarity - Hadoop & MapReduce - Evaluation -
Personalized search - Collaborative filtering and content-based recommendation of documents
and products – handling "invisible" Web - Snippet generation, Summarization, Question
Answering, Cross-Lingual Retrieval

UNIT V   DOCUMENT TEXT MINING   9
Information filtering; organization and relevance feedback – Text Mining -Text classification and
clustering - Categorization algorithms: naive Bayes; decision trees; and nearest neighbor -
Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).
                                                              TOTAL: 45 PERIODS
  OUTCOMES:
- To use an open source search engine framework and explore its capabilities
- To represent documents in different ways and discuss its effect on similarity calculations
  and on search
- To modify Page Rank and HITS
- To design and implement an innovative feature in a search engine
- To explain the search components affected by the innovation, design a smart information
  management system with Information Retrieval components

 TEXT BOOKS:
1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge
   University Press, 2008.
2. Ricardo Baeza-Yates and Berthier Ribeiro-Neto,   Modern Information Retrieval: The
   Concepts and Technology behind Search (2nd Edition) (ACM Press Books) 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in
   Practice, Addison Wesley; 1 edition 2009
4. Mark Levene, An Introduction to Search Engines and Web Navigation, Wiley; 2 edition, 2010.

 REFERENCES:
1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval:
   Implementing and Evaluating Search Engines, The MIT Press, 2010.
2. Ophir Frieder Information Retrieval: Algorithms and Heuristics (The Information Retrieval
   Series)(2nd Edition), Springer; 2nd edition, 2004
3. Manu Konchady, Building Search Applications: Lucene, LingPipe, and Gate Mustru
   Publishing; First edition,2008

PTCS8012   **MIDDLEWARE TECHNOLOGIES**   **L T P C**
                                                                        3 0 0 3

OBJECTIVES:
- To provide a sound knowledge in various middleware technologies
- To familiarize between various web service architectures and their standards

UNIT I   INTRODUCTION   9
General Middleware, Service Specific Middleware, Client/Server Building blocks – RPC - Messaging – Peer – to – Peer, Java RMI - Computing standards – OMG - Overview of CORBA - Overview of COM/DCOM - Overview of EJB - Middleware types - Middleware in distributed Applications.

UNIT II   EJB and CORBA   9
EJB architecture - Overview of EJB software architecture, EJB Conversation, Building and Deploying EJBs, Roles, applications - EJB Session Beans, EJB entity beans - Lifecycle of Beans - EJB clients - developing an application - Deployment. CORBA – components - architectural features - method invocations - static and dynamic: IDL - CORBA's self-describing data - interface repository - Building an application using CORBA - Overview of CORBA Services - Object location Services, Messaging Services - CORBA Component Model.

UNIT III   COM and .NET   9
Evolution of DCOM - Introduction to COM - COM clients and servers - COM IDL - COM Interfaces COM Threading Models – Marshalling - Custom and standard marshalling - Comparison COM and CORBA - Introduction to **.**NET - Overview of **.**NET architecture - Remoting.

UNIT IV   SOA and WEB SERVICES   9
Defining SOA - Business value of SOA - SOA characteristics - Concept of a service, Basic SOA - Enterprise Service Bus (ESB) - SOA enterprise Software Models -Services and SOA – WSDL - SOAP, UDDI, WS Standards -Web Services and Service Oriented Enterprise (SOE) - Coordination and Transaction - Business Process Execution Language for Web Services.

UNIT V   OTHER TYPES OF MIDDLEWARE   9
Other types of Middleware, Real-Time Middleware, Embedded Systems Middleware, Mobile Middleware, Oracle Fusion Middleware
                                                                TOTAL: 45 PERIODS
OUTCOMES:
- To implement programs in EJB
- To map and differentiate the functions between COM and .NET
- To outline the functionalities of various types of middleware technologies
- To design web services

TEXT BOOKS:
1. G. Sudha Sadasivam, Radha Shankarmani, "Middleware and Enterprise Integration Technologies", Wiley, 2009.
2. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju, "Web Services: Concepts, Architectures and Applications", Springer, 2010.
3. Ian Gorton, "Essential Software Architecture", Springer, 2nd Edition, 2011.

REFERENCES:
1. Judith M. Myerson, "The Complete Book of Middleware" Auerbach Publications, 1 edition, 2002.
2. Sasu Tarkoma, "Mobile Middleware: Supporting Applications and Services" Wiley 1st edition, 2009.
3. Distributed Systems Architecture: A Middleware Approach", Morgan Kaufmann, 2005.
4. Reza Shafii, Stephen Lee, and Gangadhar Konduri, "Oracle Fusion Middleware 11g Architecture and Management", McGraw-Hill Osborne Media, 1 edition, 2011.

PTCS8013   **NANO COMPUTING**   **L T P C**
                                                                             3 0 0 3

OBJECTIVES:
- To understand the basics of nano computing
- To appreciate the necessity of quantum computing
- To familiarize with quantum computing softwares

UNIT I   NANOCOMPUTING-PROSPECTS AND CHALLENGES   9
Introduction - History of Computing - Nanocomputing - Quantum Computers - Nanocomputing Technologies - Nano Information Processing - Prospects and Challenges - Physics of Nanocomputing : Digital Signals and Gates - Silicon Nanoelectronics - Carbon Nanotube Electronics - Carbon Nanotube Field-effect Transistors - Nanolithography

UNIT II   NANOCOMPUTING WITH IMPERFECTIONS   9
Introduction - Nanocomputing in the Presence of Defects and Faults - Defect Tolerance - Towards Quadrillion Transistor Logic Systems

UNIT III   RELIABILITY OF NANOCOMPUTING   9
Markov Random Fields - Reliability Evaluation Strategies - NANOLAB - NANOPRISM - Reliable Manufacturing and Behavior from Law of Large Numbers

UNIT IV   NANOSCALE QUANTUM COMPUTING   9
Quantum Computers - Hardware Challenges to Large Quantum Computers - Fabrication, Test, and Architectural Challenges - Quantum-dot Cellular Automata (QCA) - Computing with QCA - QCA Clocking - QCA Design Rules

UNIT V   QCADESIGNER SOFTWARE AND QCA IMPLEMENTATION   9
Basic QCA Circuits using QCADesigner - QCA Implementation - Molecular and Optical Computing: Molecular Computing - Optimal Computing - Ultrafast Pulse Shaping and Tb/sec Data Speeds

                                                                 TOTAL: 45 PERIODS

OUTCOMES:
- To list the challenges and issues in nano-computing research
- To identify the challenges in quantum computing
- To develop programs for QCA

TEXT BOOK:
1. Sahni V. and Goswami D., Nano Computing, McGraw Hill Education Asia Ltd.   (2008), ISBN (13): 978007024892.

REFERENCES:
1. Sandeep K. Shukla and R. Iris Bahar., Nano, Quantum and Molecular Computing, Kluwer Academic Publishers (2004), ISBN: 1402080670.
2. Sahni V, Quantum Computing, McGraw Hill Education Asia Ltd. (2007).
3. Jean-Baptiste Waldner, Nanocomputers and Swarm Intelligence, John Wiley & Sons, Inc. (2008), ISBN (13): 978-1848210097.

PTCS8014   **NATURAL LANGUAGE PROCESSING**   **L T P C**
                                                                  3 0 0 3

OBJECTIVES:
*   To learn the fundamentals of natural language processing
*   To appreciate the use of CFG and PCFG in NLP
*   To understand the role of semantic analysis

UNIT I   INTRODUCTION   9
Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues - Applications - The role of machine learning - Probability Basics –Information theory – Collocations -N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.

UNIT II   MORPHOLOGY AND PART OF SPEECH TAGGING   9
Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields

UNIT III   SYNTAX PARSING   9
Syntax Parsing - Grammar formalisms and treebanks - Parsing with Context Free Grammars - Features and Unification -Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs.

UNIT IV   SEMANTIC ANALYSIS   9
Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation - Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics- Semantic Role Labeling and Semantic Parsing – Discourse Analysis.

UNIT V   APPLICATIONS   9
Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering
                                                      TOTAL: 45 PERIODS

OUTCOMES:
*   To tag a given text with basic Language processing features
*   To design an innovative application using NLP components
*   To implement a rule based system to tackle morphology/syntax of a language
*   To design a tag set to be used for statistical processing for real-time applications
*   To compare and contrast use of different statistical approaches for different types of NLP applications.

TEXT BOOKS:
1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2 edition, 2008
2. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition, 2009
4. Roland R. Hausser, Foundations of Computational Linguistics: Human-Computer Communication in Natural Language, Paperback, MIT Press, 2011

REFERENCES:
1. Pierre M. Nugues, An Introduction to Language Processing with Perl and Prolog: An Outline of Theories, Implementation, and Application with Special Consideration of English, French, and German (Cognitive Technologies) Softcover reprint, 2010
2. James Allen, Natural Language Understanding, Addison Wesley; 2 edition 1994
3. NLTK – Natural Language Tool Kit - http://www.nltk.org/

PTCS8015   NETWORK ANALYSIS AND MANAGEMENT   L T P C
3 0 0 3

OBJECTIVES:
- To learn the network analysis and flow analysis with a network tool
- To understand the evaluation methodologies for Network analysis and Management

UNIT I   INRODUCTION   9
Introduction – Requirement Analysis Concepts – Requirement Analysis Process – Flow Analysis

UNIT II   ARCHITECTURE   9
Network Architecture – Addressing and Routing Architecture – Performance architecture – Security and Privacy Architecture – Network Analysis Tool

UNIT III   NETWORK MANAGEMENT   9
Network Management Overview - Management Perspective: Dimensions of the Management: Management Interoperability, Management Life cycle, Management Layers – Management functions and reference models

UNIT IV   NETWORK MANAGEMENT ORGANIZATION   9
Management Information – Management Communication Patterns: Rules of conversation. Common Management Protocols – Management organization

UNIT V   MANAGEMENT INTEGERATION   9
Applied Network Management: Management Integration – Service Level Management – Management Metrics: Assessing Management Impact and Effectiveness – Case Study: NMS, Organization Network

TOTAL: 45 PERIODS
OUTCOMES:
- To use a network analysis tool to analyse a given network
- To use NMS for network management operations

TEXT BOOKS:
1. James D.McCabe, Network Analysis, Architecture and Design, 3rd Edition, Elsevier, 2007.
2. Alexander Clemm, Network Management Fundamentals, 1st Edition, Cisco Press, 2006.

REFERENCES:
1. Larry Walsh, SNMP MIB Handbook, 2008.
2. Laura Chappell and Gerals combs, Wireshark Network Analysis, 1st Edition, 2010.
3. William Stallings, SNMP, SNMPV2, SNMPV3, AND RMON 1&2, 3rd Edition, 1999.

PTCS8016   PRINCIPLES OF CRYPTOGRAPHY AND NETWORK SECURITY   L T P C
                                                                3 0 0 3

OBJECTIVES:
- To appreciate the use of cryptography and digital signatures
- To learn the standards of encryption
- To learn various encryption algorithms
- To know the importance of network security
- To learn various types of network attacks

UNIT I   CLASSICAL CRYPTOSYSTEM   9
Security trends – Security Attacks and services – Symmetric cipher model- Classical Encryption Techniques –– LFSR sequences – Basic Number theory – Congruences – Chinese Remainder theorem – Modular exponentiation – Fermat and Euler's theorem – Legendre and Jacobi symbols – Finite Field – Galois Field.

UNIT II   BLOCK CIPHER   9
Simple DES – DES – Modes of operation – Triple DES – AES – RC4 – RSA – Attacks – Primality test – factoring.

UNIT III   MESSAGE AUTHENTICATION   9
Discrete Logarithms – Computing discrete logs – Diffie-Hellman key exchange – ElGamal Public key cryptosystems – Hash functions – Secure Hash – Birthday attacks - MD5 – Digital signatures – RSA – ElGamal – DSA.

UNIT IV   NETWORK SECURITY   9
Kerberos, X.509, PKI – Electronic Mail security – PGP – IP security – Web Security – SSL, TLS, SET.

UNIT V   WIRELESS NETWORK SECURITY   9
Wireless Network Security- IEEE 802.11 Wireless LANs - Protocol Overview and Security - Wireless Application Protocol (WAP) - Protocol Overview - Wireless Transport Layer Security (WTLS).
                                                              TOTAL: 45 PERIODS
OUTCOMES:
- To demonstrate the fundamentals of encryption using popular algorithms
- To compile security protocols and practices for wired and wireless networks
- To design a firewall

TEXT BOOKS:
1. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson/PHI, 5th ed, 2006. [Unit II, Unit III, Unit IV, Unit V]
2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007. [Unit I]

REFERENCES:
1. W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education, Second Edition, 2007.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in computing", Third Edition – Prentice Hall of India, 2006.
3. Douglas R. Stinson. "Cryptography, theory and practice", Third edition, CRS Press, 2006.

PTCS8017   **PRINCIPLES OF DISTRIBUTED SYSTEMS**   **L T P C**
                                                                                       3 0 0 3

OBJECTIVES:
- To explain the goals and types of distributed systems
- To describe operation of distributed OS
- To emphasize the benefits of using distributed transactions
- To learn issues related to developing fault-tolerant systems

UNIT I   **INTRODUCTION**   **9**
Introduction to Distributed systems - challenges - architectural models - fundamental models - P2P systems - Introduction to interprocess communications - external data representation and marshalling- client server communication - group communication-multicast/pubsub - Energy Efficient Computing - Cloud computing

UNIT II   **DISTRIBUTED OBJECTS AND FILE SYSTEM**   **9**
Introduction - Communication between distributed objects - Remote procedure call - Events and notifications - Java RMI case Study - Introduction to DFS - File service architecture – Google file system - Introduction to Name Services- Name services and DNS - Directory and directory services-ClusterComputing-mapreduce/bigtable.

UNIT III   **DISTRIBUTED OPERATING SYSTEM SUPPORT**   **9**
The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed mutual exclusion - Overlay Networks – DHT

UNIT IV   **TRANSACTION AND CONCURRENCY CONTROL-DISTRIBUTED**
                        TRANSACTIONS   **9**
Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery - Data- Intensive Computing and Map Reduce

UNIT V   **FAULT TOLERANCE, SECURITY AND REPLICATION**   **9**
Overview of security techniques - Cryptographic algorithms – Digital signatures - Cryptography pragmatics – Distributed Replication - CDNs and replication – Fault tolerant services - Byzantine Fault Tolerance - Detecting and Correcting Local Faults - Logging and Crash Recovery – Highly available services – Transactions with replicated data.
Case study: Multiplayer online games, Social networking services, Large object CDN's (video/audio streaming systems)

                                                TOTAL: 45 PERIODS

OUTCOMES:
- To implement distributed systems in the areas of system processes, communication applications, naming and synchronization
- To design distributed systems that take into account consistency, replication and/or fault tolerance
- To evaluate the security of distributed systems.

TEXT BOOKS:
1. Tanenbaum, A. and van Steen, M., Distributed Systems: Principles and Paradigms, 2nd ed, Prentice Hall, 2007. ISBN: 0132392275.
2. Coulouris, G, Dollimore, J., and Kindberg, Distributed Systems: Concepts and Design, 4rd ed T., Addison-Wesley, 2006. ISBN: 0321263545

REFERENCES:
1. Mukesh Singhal, Ohio State University, Columbus ,"Advanced Concepts In Operating Systems", McGraw-Hill Series in Computer Science, 1994.
2. Kenneth P. Birman, "Reliable Distributed Systems: Technologies, Web Services, and Applications", Springer
3. Haggit Attiya, "Distributed Computing: Fundamentals, Simulations, and Advanced **E-**

PTCS8018   PRINCIPLES OF EMBEDDED AND REAL TIME SYSTEMS   L T P C
                                                                3 0 0 3

OBJECTIVES:
- To obtain a broad understanding of the technologies and applications of embedded and real-time systems
- To understand the architecture of embedded systems and real-time systems
- To have a basic knowledge on the various issues involved in real-time databases
- To know how embedded systems can be made more fault tolerant
- To learn about embedded/real-time operating systems and the various issues associated with them

UNIT I   INTRODUCTION TO EMBEDDED SYSTEM ARCHITECTURE   9
Embedded System - Introduction – Application Areas – Overview of Embedded System Architecture – Specialties – Recent Trends – Hardware Architecture – Software Architecture – Application Software – Communication Software – Process of Generating Executable Image – Programming for Embedded Systems – Memory Management – Device Drivers – Productivity Tools –Embedded System - Development Process - Embedded System Fiascos

UNIT II   REAL-TIME SYSTEM AND TASKS   9
Issues in Real Time Computing, Structure of a Real Time System - Task Classes, Performance Measures for Real Time Systems, Estimating Program Run times. Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms, Uni-Processor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and Fault Tolerant Scheduling.

UNIT III   REAL-TIME DATABASES AND COMMUNICATION   9
Introduction – Main Memory Databases – Transaction Priorities – Concurrency Control Issues – Disk Scheduling Algorithms – Databases for Hard Real-Time Systems – Fault-Tolerant Routing

UNIT IV   FAULT-TOLERANCE TECHNIQUES   9
Fault Types – Temporal Behavior Classification, Output Behavior Classification, Independence and Correlation - Fault Detection – Fault and Error Containment – Redundancy – Hardware, Software, Time, Information - Data Diversity – Reversal Checks – Integrated Failure Handling

UNIT V   EMBEDDED/REAL-TIME OPERATING SYSTEMS   9
RS232/UART – RS422/RS485 – US – Infrared – IEEE 1394 Firewire – Ethernet – Bluetooth – Architecture of Kernel – ISR – Semaphores – Mutex – Mailboxes – Message Queues – Event Registers – Pipes – Signals – Timers – Memory Management – Priority Inversion Problem – Off-the-shelf Operating Systems – Embedded OS – Real-Time OS – Handheld OS – Target Image Creation – Representative Embedded Systems.

                                                                TOTAL: 45 PERIODS

OUTCOMES:
- To outline the ideas of real-time task scheduling
- To explain techniques of fault-tolerance
- To analyse the operations of real-time OS

TEXT BOOKS:
1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", McGraw Hill International Editions, 1997. (Unit 2,3,4)
2. Dr. K.V.K.K. Prasad, "Embedded/Real-Time Systems: Concepts, Design and Programming", Dreamtech Press, 2008. (Unit 1,5)

REFERENCES:
1. Andrew N Sloss, D. Symes, C. Wright, " Arm system developers guide", Morgan Kauffman/ Elsevier, 2006.
2. Michael J. Pont, "Embedded C", Pearson Education, 2007.
3. Stuart Bennett, "Real Time Computer Control-An Introduction", Second edition, Prentice Hall PTR, 1994.
4. Peter D. Lawrence, "Real time Micro Computer System Design – An Introduction", McGraw Hill, 1988.
5. S.T. Allworth and R.N. Zobel, "Introduction to real time software design", Macmillan, II Edition, 1987.

PTCS8019	SOFTWARE QUALITY AND TESTING	L T P C
		3 0 0 3

OBJECTIVES:
- To understand the basics of software quality
- To learn various metrics of software quality
- To introduce concepts behind designing of test cases
- To learn the procedure of debugging a given software

UNIT I   INTRODUCTION TO SOFTWARE QUALITY   8
Ethical Basis for Software Quality – Total Quality Management Principles – Software Processes and Methodologies – Quality Standards, Practices & Conventions – Improving Quality with Methodologies – Structured/Information Engineering – Measuring Customer Satisfaction– Software Quality Engineering – Defining Quality Requirements – Management Issues for Software Quality – Data Quality Control – Benchmarking and Certification.

UNIT II SOFTWARE QUALITY METRICS AND RELIABILITY 9

Writing Software Requirements and Design Specifications – Analyzing Software Documents using Inspections and Walkthroughs – Software Metrics – Lines of code, Cyclomatic Complexity, Function Points, Feature Points – Software Cost Estimation– Reliability Models – Reliability Growth Models – OO Metrics.

UNIT III TEST CASE DESIGN 11

Testing as an Engineering Activity – Testing Fundamentals – Defects – Strategies and Methods for Black Box Test Case Design – Strategies and Methods for White-Box Test Case design – Test Adequacy Criteria – Evaluating Test Adequacy Criteria – Levels of Testing and different types of testing – OO Testing.

UNIT IV TEST MANAGEMENT 9

Testing and Debugging Goals and Policies – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Reporting Test Results – The role of three groups in Test Planning and Policy Development – Process and the Engineering Disciplines – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group.

UNIT V CONTROLLING AND MONITORING 8

Measurement and Milestones for Controlling and Monitoring – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of reviews – Developing a review program – Components of Review Plans – Reporting review results.

TOTAL: 45 PERIODS

OUTCOMES:
- To analyse software documentations using inspections and walkthrough
- To associate various software metrics to context
- To list the components of test plan
- To explain the principles behind SCM

TEXT BOOKS:
1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, Chennai, 2003.
2. Stephen Kan, "Metrics and Models in Software Quality", Addison-Wesley, Second Edition, 2004.

REFERENCES:
1. Milind Limaye, "Software Quality Assurance", McGraw Hill, 2011.
2. M G Limaye, "Software Testing – Principles, Techniques and Tools", McGraw Hill, 2011.
3. Edward Kit, "Software Testing in the Real World – Improving the Process", Pearson Education, New Delhi, 1995.
4. Elfriede Dustin, "Effective Software Testing", Pearson Education, New Delhi, 2003.
5. Renu Rajani and Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, New Delhi, 2003.
6. Yogesh Singh, "Software Testing" Cambridge University Press India, 2012.

PTCS8020   **SYSTEM MODELING AND SIMULATION**   **L T P C**
                                                            3 0 0 3

OBJECTIVES:
- To understand the concepts using natural models of computation
- To learn various mathematical models
- To learn to analyse simulation data
- To get introduced to various simulation tools

UNIT I   INTRODUCTION TO SIMULATION   9

Introduction – Simulation Terminologies- Application areas – Model Classification Types of Simulation- Steps in a Simulation study- Concepts in Discrete Event Simulation Example.

UNIT II   MATHEMATICAL MODELS   9

Statistical Models - Concepts – Discrete Distribution- Continuous Distribution – Poisson Process- Empirical Distributions- Queueing Models – Characteristics- Notation Queueing Systems – Markovian Models- Properties of random numbers- Generation of Pseudo Random numbers- Techniques for generating random numbers-Testing random number generators- Generating Random-Variates- Inverse Transform technique Acceptance- Rejection technique – Composition & Convolution Method.

UNIT III   ANALYSIS OF SIMULATION DATA   9

Input Modeling - Data collection - Assessing sample independence – Hypothesizing distribution family with data - Parameter Estimation - Goodness-of-fit tests – Selecting input models in absence of data- Output analysis for a Single system – Terminating Simulations – Steady state simulations.

UNIT IV   VERIFICATION AND VALIDATION   9

Building – Verification of Simulation Models – Calibration and Validation of Models – Validation of Model Assumptions – Validating Input – Output Transformations.

UNIT V   SIMULATION OF COMPUT ER SYSTEMS AND CASE
**   STUDIES   9**

Simulation Tools – Model Input   – High level computer system simulation – CPU   – Memory Simulation – Comparison of systems via simulation – Simulation Programming techniques - Development of Simulation models.

TOTAL: 45 PERIODS

OUTCOMES:
- To apply statistical models for simulation
- To compare various systems for simulation

TEXT BOOKS:
1. Jerry Banks and John Carson, "Discrete Event System Simulation", Fourth Edition, PHI, 2005.
2. Geoffrey Gordon, "System Simulation", Second Edition, PHI, 2006.

REFERENCES:
1. Frank L. Severance, " System Modeling and Simulation", Wiley, 2001.
2. Averill M. Law and W.David Kelton, "Simulation Modeling and Analysis, Third   Edition, McGraw Hill, 2006.
3. Jerry Banks, "Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice", Wiley-Interscience, 1 edition, 1998.

PTCS8071	CYBER FORENSICS	L T P C
	(Common to CSE & IT branches)	3 0 0 3

OBJECTIVES:
- To understand Computer Forensics, Computing Investigations, Enforcement Agency Investigations, Corporate Investigations, forensically sound principles and practices related to digital evidence collection, management, and handling.

UNIT I   TYPES OF COMPUTER FORENSICS   9
Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.

UNIT II   DATA RECOVERY   9
Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

UNIT III   ELECTRONIC EVIDENCE   9
Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events – Networks.

UNIT IV   THREATS   9
Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.

UNIT V   SURVEILLANCE   9
The Future – Arsenal – Surveillance Tools – Victims and Refugees – Advanced Computer Forensics.

TOTAL: 45 PERIODS

OUTCOMES:
- To demonstrate data recovery from hardware
- To list various software threats
- To identify and explain the working of surveillance tools

TEXT BOOK:
1. John R. Vacca, "Computer Forensics", Firewall Media, 2004.

REFERENCES:
1. Chad Steel, "Windows Forensics", Wiley India, 2006.
2. Majid Yar, "Cybercrime and Society", Sage Publications, 2006.
3. Robert M Slade, "Software Forensics", Tata McGraw Hill, 2004

PTCS8072   GAME PROGRAMMING   L T P C
(Common to CSE & IT branches)   3 0 0 3

OBJECTIVES:
- To get subsequent understanding of game design and development
- To learn the processes, mechanics, issues in game design
- To get exposed to the architecture of game programming
- To know about game engine development, modeling, techniques and frameworks
- To learn about 3D graphics principles and animation techniques

UNIT I   3D GRAPHICS FOR GAME PROGRAMMING   9
Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

UNIT II   GAME DESIGN PRINCIPLES   9

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding

UNIT III   GAMING ENGINE DESIGN   9

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT IV   GAMING PLATFORMS AND FRAMEWORKS   9

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

UNIT V   GAME DEVELOPMENT   9

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

TOTAL: 45 PERIODS

OUTCOMES:
- To create interactive games

TEXT BOOKS:
1. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann, 2 Edition, 2006.
2. JungHyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 1st edition, 2011.
3. Mike McShaffrfy, "Game Coding Complete", Third Edition, Charles River Media, 2009.
4. Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3 edition, 2009.

REFERENCES:
1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall 1st edition, 2006.
2. Roger E. Pedersen, "Game Design Foundations", Edition 2, Jones & Bartlett Learning, 2009.
3. Scott Rogers, "Level Up!: The Guide to Great Video Game Design", Wiley, 1st edition, 2010.
4. Jason Gregory, "Game Engine Architecture", A K Peters, 2009.
5. Jeannie Novak, "Game Development Essentials", 3rd Edition, Delmar Cengage Learning, 2011.
6. Andy Harris, "Beginning Flash Game Programming For Dummies", For Dummies; Updated edition, 2005.
7. John Hattan, "Beginning Game Programming: A GameDev.net Collection", Course Technology PTR, 1 edition, 2009.
8. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", Third Edition, Course Technology PTR, 3rd edition, 2011.
9. Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1st edition 2012.
10. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, "Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer", 1st edition, Wiley, 2007.

PTCS8073	SEMANTIC WEB	L T P C
	(Common to CSE & IT branches)	3 0 0 3

OBJECTIVES:

- To understand the semantic web architecture
- To learn about ontological engineering
- To learn web ontology language
- To discover the capabilities and limitations of semantic web technology for different applications

UNIT I INTRODUCTION 9

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies –Semantic Modeling -Potential of semantic web solutions and challenges of adoption

UNIT II ONTOLOGICAL ENGINEERING 9

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies - Terminological aspects: concepts, terms, relations between them – Complex Objects -Subclasses and Sub-properties definitions –Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning

UNIT III STRUCTURING AND DESCRIBING WEB RESOURCES 9

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modelling for Combinations and Patterns- Transitivity

UNIT IV WEB ONTOLOGY LANGUAGE 9

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic.

UNIT V SEMANTIC WEB TOOLS AND APPLICATIONS 9

Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Desktop – Semantic Wikis -Semantic Web Services – Application in Science – Business

TOTAL: 45 PERIODS

OUTCOMES:

- To build and implement a small ontology that is semantically descriptive of the chosen problem domain
- To implement applications that can access, use and manipulate the ontology
- To represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology
- To depict the semantic relationships among the data elements using Resource Description Framework (RDF)
- To design and implement a web services application that "discovers" the data and/or other web services via the semantic web

TEXT BOOKS:
1. Liyang Yu, A Developer's Guide to the Semantic Web, Springer; 1st Edition. Edition, 2011.
2. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, Semantic Web Programming, Wiley; 1 edition, 2009.
3. Grigoris Antoniou, Frank van Harmelen, A Semantic Web Primer, Second Edition (Cooperative Information Systems) (Hardcover), MIT Press, 2008
4. Robert M. Colomb, Ontology and the Semantic Web: Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications, IOS Press, 2007.
5. Dean Allemang and James Hendler, Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Morgan Kaufmann; 2 edition, 2011.

REFERENCES:
1. Michael C. Daconta, Leo J. Obrst and Kevin T. Smith, The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management, Wiley; 1 edition 2003
2. Karin Breitman, Marco Antonio Casanova and Walt Truszkowski, Semantic Web: Concepts, Technologies and Applications (NASA Monographs in Systems and Software Engineering), Springer; Softcover, 2010.
3. Vipul Kashyap, Christoph Bussler and Matthew Moran, The Semantic Web: Semantics for Data and Services on the Web (Data-Centric Systems and Applications), Springer, 2008.

PTCS8074   **SOFTWARE AGENTS**   **L T P C**
                                                                                3 0 0 3
OBJECTIVES:
- To understand how software agents reduce information overhead
- To gain knowledge in use of software agents for cooperative learning and personal assistance
- To know how agent can communicate and share knowledge using agent communication language
- To gain knowledge in design of an agent interpreter and intelligent agent
- To understand the concept of mobile technology and mobile agents and its security

UNIT I   AGENT AND USER EXPERIENCE   9
Agent characteristics- object Vs agent. Agent types- Interacting with Agents - Agent From Direct Manipulation to Delegation - Interface Agent, Metaphor with Character – Designing Agents – problem solving agent, rational agent. Direct Manipulation versus Agent Path to Predictable

UNIT II   AGENTS FOR LEARNING AND ASSISTANCE   9
Agents for Information Sharing and Coordination - Agents that Reduce Work Information Overhead - Agents without Programming Language - Life like Computer character - S/W Agents for cooperative Learning – Multiple Reasoning agents –M system. Learning agents: computational architectures for learning agents; evolution, adaptation; multi-agent learning.

UNIT III   AGENT COMMUNICATION AND COLLABORATION   9
Overview of Agent Oriented Programming - Agent Communication Language – KQML-Per formatives. Agent Based Framework of Interoperability. Virtual agents: agents in games and virtual environments; companion and coaching agents; modeling personality, emotions; multimodal interaction; verbal and non-verbal expressiveness.

UNIT IV   AGENT ARCHITECTURE   9
Strategies for agent design.   Agent   interpreter- BDI architecture. Architecture of Intelligent Agents. Agents for Information Gathering - Open Agent Architecture - Communicative Action for Artificial Agent. Agent societies and societal issues.

UNIT V   MOBILE AGENTS   9
Mobile agent paradigm - Mobile agent concepts - -Mobile agent technology – programming mobile agents –application of mobile agents- Teleshopping. Mobile agent security- trust, reliability and reputation.

TOTAL: 45 PERIODS

OUTCOME:
To develop a software agent for real-time application

TEXT BOOK:
1. Jeffrey M.Bradshaw," Software Agents ", MIT Press 2000, Pearson Indian Reprint 2010.

REFERENCES:
1. Lin, Fuhua Oscar (Ed.), "Designing Distributed Learning Environments with Intelligent Software Agents", Information Science Publishing, 2004
2. Russel & Norvig, " Artificial Intelligence: A Modern Approach ", Pearson Education', 2nd Edition, 2003.
3. Murch Richard, Johnson Tony 'Intelligent Software Agents, 'Prentice Hall, 2000.
4. Joseph P.Bigus & Jennifer Bigus, "Constructing Intelligent agents with Java: A Programmer's Guide to Smarter Applications ", Wiley, 1997.
5. Knapik, Michael and Jay Johnson 'Developing Intelligent Agents for Distributed Systems: Exploring Architecture, Technologies, and Applications' , McGraw-Hill.1998
6. William R. Cockayne, Michael Zyda, "Mobile Agents", Prentice Hall, 1998

PTCS8075	UNIX INTERNALS	L T P C
	(Common to CSE & IT branches)	3 0 0 3

OBJECTIVES:
- To provide knowledge about Unix operating system working principles, its file system and programming for interprocess communication
- To learn shell programming and filters
- To get an understanding on using various system calls

UNIT I   OVERVIEW   9
General Overview of the System : History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel : Architecture of the UNIX operating system – Introduction to system concepts. The Buffer Cache: Buffer headers – Structure of the buffer pool – Scenarios for retrieval of a buffer – Reading and writing disk blocks – Advantages and disadvantages of the buffer cache.

UNIT II   FILE SUBSYSTEM   9
Internal representation of files: Inodes – Structure of a regular file – Directories –Conversion of a path name to an Inode – Super block – Inode assignment to a new file – Allocation of disk blocks

UNIT III   SYSTEM CALLS FOR THE FILE SYSTEM   9

Open – Read – Write – File and record locking – Adjusting the position of file I/O – Lseek – Close – File creation – Creation of special files – Changing directory, root, owner, mode – stat and fstat – Pipes – Dup – Mounting and unmounting file systems – link – unlink

UNIT IV   PROCESSES   9

Process states and transitions – Layout of system memory – The context of a process – Saving the context of a process – Manipulation of the process address space - Sleep. Process Control : Process creation – Signals – Process termination – Awaiting process termination – Invoking other programs – user id of a process – Changing the size of a process - Shell – System boot and the INIT process– Process Scheduling

UNIT V   MEMORY MANAGEMENT AND I/O   9

Memory Management Policies : Swapping – Demand paging. The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers– Streams – Inter process communication.

TOTAL: 45 PERIODS

OUTCOMES:
- To write UNIX programs using file system calls
- To write UNIX programs for process scheduling and page replacement

To write UNIX programs on inter-process communication

TEXT BOOK:
1. Maurice J. Bach, "The Design of the Unix Operating System", First Edition, Pearson Education, 1999.

REFERENCES:
1. B. Goodheart, J. Cox, "The Magic Garden Explained", Prentice Hall of India, 1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels and J. S. Quarterman., "The Design And Implementation of the 4.3 BSD Unix Operating System", Addison Wesley, 1998.
3. Uresh Vahalia, "Unix Internals: The New Frontiers", Pearson Education, 1996.
4. Steve D Pate, "UNIX File systems: Evolution, Design and Implementation", Wiley Publishing Inc., 2003.

PTGE8551	ENGINEERING ETHICS AND HUMAN VALUES	L T P C
	(Common to CSE, ECE, EEE, Industrial, Textile, Printing, Auto, Mechanical & Civil branches)	3 0 0 3

OBJECTIVE:
The course explains various moral issues through predominant theories. It educates the code of ethics as well as the industry standards and how they can be used for ensuring safety and reducing the risk. The course enunciated the Rights and Responsibilities of individuals. Various other ethical global issues also have been explained along with case studies.

UNIT I   HUMAN VALUES   10

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality.

UNIT II   ENGINEERING ETHICS   9
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories

UNIT III   ENGINEERING AS SOCIAL EXPERIMENTATION   9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study

UNIT IV   SAFETY, RESPONSIBILITIES AND RIGHTS   9
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – The Three Mile Island and Chernobyl Case Studies
Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination

UNIT V   GLOBAL ISSUES   8
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

OUTCOMES:
- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOK:
1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

REFERENCES:
1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

WEB SOURCES:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

OBJECTIVES:
The student should be made to:
- Understand the techniques for processing images including the different File formats used
- Be exposed different image enhancement techniques
- Learn about image segmentation and feature analysis
- Understand the role of multi resolution analysis in image processing
- Study various applications of image processing

UNIT I   FUNDAMENTALS OF IMAGE PROCESSING   9
Introduction - Steps in image processing systems - Image acquisition - Sampling and Quantization - Pixel relationships - Color fundamentals and models - File Formats, Image operations: Arithmetic, Geometric and Morphological.

UNIT II   IMAGE ENHANCEMENT   9
Spatial Domain - Gray level transformations - Histogram processing - Spatial filtering - Smoothing and sharpening - Frequency domain: Filtering in frequency domain - DFT, FFT, DCT - Smoothing and sharpening filters - Homomorphic filtering

UNIT III   IMAGE SEGMENTATION AND FEATURE ANALYSIS   9
Detection of discontinuities - Edge operators - Edge linking and boundary Detection - Thresholding - Region based segmentation - Morphological Watersheds - Motion segmentation, Feature analysis and extraction

UNIT IV   MULTI RESOLUTION ANALYSIS AND COMPRESSIONS   9
Multi Resolution analysis : Image pyramids - Multi resolution expansion - Wavelet transforms - Image compression : Fundamentals - Models - Elements of information theory - Error free compression - Lossy compression - Compression standards

UNIT V   APPLICATIONS OF IMAGE PROCESSING   9
Image classification - Image recognition - Image understanding - Video motion analysis - Image fusion - Steganography - Digital compositing - Mosaics - Color image processing.
                                                        TOTAL: 45 PERIODS
OUTCOMES:
At the end of this course, the student will be able to:
- Explain the various steps in image processing
- Compare and Contrast different image enhancement techniques
- Critically analyze various image segmentation and feature analysis
- Apply Multi resolution analysis to image processing
- Design various applications using image processing

TEXT BOOKS:
1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2009.
2. S.Sridhar, "Digital Image Processing", Oxford University Press, 2011.

REFERENCE BOOKS:
1. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Second Edition, Thompson Learning, 2007.
2. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI, 2011.
3. Sanjit K. Mitra, & Giovanni L. Sicuranza, "Non Linear Image Processing", Elsevier, 2007.

PTIT8072	FREE AND OPEN SOURCE SOFTWARE	L T P C
	(Common to CSE & IT branches)	3 0 0 3

OBJECTIVES:
The student should be made to:
- Be exposed to the context and operation of free and open source software (FOSS) communities and associated software projects.
- Be familiar with participating in a FOSS project
- Learn scripting language like Python
- Learn some important FOSS tools

UNIT I   PHILOSOPHY   6
Linux,GNU and Freedom, Brief history of GNU, Licensing free   software – GPL and copy Left, trends and potential – global and Indian, overview and usage of various Linux Distributions – userfriendliness perspective – scientific perspective

UNIT II   SYSTEM ADMINISTRATION   10
GNU and linux installation – Boot process, Commands Using bash features, The man pages, files and file systems, File security, Partitions, Processes, Managing processes, I/O redirection, Graphical environment, Installing software, Backup techniques

UNIT III   FOSS PROGRAMMING PRACTICES   10
GNU debugging tools, Using source code versioning and managing tools, Review of common programming practices and guidelines for GNU/Linux and FOSS, Documentation

UNIT IV   PROGRAMMING TECHNIQUES   10
Application programming – Basics of X Windows server architecture – QT programming – GTK + Programming - Python programming – Open source equivalent of existing Commercial software

UNIT V   PROJECTS AND CASE STUDIES   9
Linux for portable Devices, Creation of Bootable CD and USB from command line, Case Studies – Samba, Libreoffice, Assistive technology

OUTCOMES:
Upon completion of the course, the student should be able to:
- Install and run open-source operating systems.
- Gather information about Free and Open Source Software projects from software releases and from sites on the internet.
- Build and modify one or more Free and Open Source Software packages.
- Use a version control system.
- Contribute software to and interact with Free and Open Source Software development projects.

TEXT BOOK:
1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, Linux in a nutshell, Sixth edition, OReilly media, September 2009.

REFERENCE BOOKS:
1. Philosophy of GNU URL: http://www.gnu.org/philosophy/
2. Overview of Linux Distributions URL: http://distrowatch.com/dwres.php?resource=major
3. Introduction to Linux – A Hands on Guide, URL: http://tldp.org/guides.html
4. **Linux:** Rute's User tutorial and exposition , URL: http://rute.2038bug.com/index.html.gz
5. Version control system , URL: http://git-scm.com/
6. SVN version control , URL: http://svnbook.red-bean.com/
7. GTK+/GNOME
8. Application
9. Development,
10. Havoc
11. Pennington.
12. URL:
13. http://developer.gnome.org/doc/GGAD
14. Python Tutorial, Guido van Rossum, Fred L. Drake, Jr., Editor. URL:
15. http://www.python.org/doc/current/tut/tut.html
16. Doug Abbot, Linux for Embedded and Embedded and Real time applications , Newnes
17. Case study SAMBA: URL : http://www.samba.org/
18. Case study., Libre office: http://www.libreoffice.org/
19. Case study, ORCA: http://live.gnome.org/Orca

PTIT8073	TCP/IP DESIGN AND IMPLEMENTATION	L T P C
	(Common to CSE & IT branches)	3 0 0 3

OBJECTIVES:
- To learn the basics of socket programming using TCP Sockets.
- To learn about Socket Options
- To learn to develop Macros for including Objects In MIB Structure
- To understand SNMPv1, v2 and v3 protocols & practical issues.

UNIT I   FUNDAMENTALS   9
Internetworking concepts - IP and datagram forwarding - TCP services - Interactive data flow - Timeout and retransmission - Bulk data flow - Persist timer – Keep-alive timer

UNIT II   ARP AND IP   9
Structure of TCP/IP in OS - Data structures for ARP - Cache design and management - IP software design and organization - Sending a datagram to IP

UNIT III   IP ROUTING IMPLEMENTATION   9
Routing table - Routing algorithms - Fragmentation and reassembly - Error processing (ICMP) - Multicast Processing (IGMP)

UNIT IV   TCP I/O PROCESSING AND FSM   9
Data structure and input processing - Transmission control blocks - Segment format - Comparison - Finite state machine implementation - Output processing - Mutual exclusion - Computing TCP data length

UNIT V   TCP TIMER AND FLOW CONTROL   9
Timers - Events and messages - Timer process - Deleting and inserting timer event - Flow control and adaptive retransmission - Congestion avoidance and control - Urgent data processing and push function

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the student should be able to
- Understand the internals of the TCP/IP protocols
- Understand how TCP/IP is actually implemented
- Understand the interaction among the protocols in a protocol stack

TEXT BOOKS:
1. Douglas E. Comer, "Internetworking with TCP/IP Principles, Protocols and Architecture", Vol. 1 Fifth edition, Pearson Education Asia, 2006.
2. Douglas E. Comer, "Internetworking with TCP/IP - Design, Implementation and Internals", Vol. 2 Third edition, Pearson Education Asia, 1999.

REFERENCE:
1. W.Richard Stevens, "TCP/IP illustrated-The Protocols", Volume 1, Pearson Education, 2003.

PTMG8651	TOTAL QUALITY MANAGEMENT	L T P C
	(Common to Manufacturing, Mechanical, Production, Printing, Industrial, Auto, Leather, CSE, ECE, IT & EEE)	3 0 0 3

AIM:
To provide comprehensive knowledge about the principles, practices, tools and techniques of Total quality management.

OBJECTIVES:
- To understand the various principles, practices of TQM to achieve quality.
- To learn the various statistical approaches for Quality control.
- To understand the TQM tools for continuous process improvement.
- To learn the importance of ISO and Quality systems

UNIT I   INTRODUCTION   9
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality - Basic concepts of TQM – TQM Framework - Contributions of Quality Gurus – Barriers to TQM – Cost of Quality.

UNIT II   TQM PRINCIPLES   9
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III   TQM TOOLS & TECHNIQUES I   9
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS & TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Performance measures - BPR.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits –Quality Council – Leadership, Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward.

TOTAL : 45 PERIODS

OUTCOMES :

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:

1. Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint , 2006.

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition , 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006 .
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases",Prentice Hall (India) Pvt. Ltd., 2006.

PTCS8075	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L T P C
		3 0 0 3

OBJECTIVE:

This program can be offered with all Undergraduate programs/courses for all engineering streams. The FSIPD program aims to improve student's awareness and understanding of the basic concepts involved in Integrated product Development (IPD) by providing exposure to the key product development concepts. Students, who complete this program, will stand a better chance to be considered for jobs in the Engineering industry.

OBJECTIVES:

After completing this program, the student will be able to obtain the technical skills needed to effectively play the entry level design engineer role in an engineering organization.

The student will be able to:

- Understand the global trends and development methodologies of various types of products and services
- Conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating

the hardware, software, controls, electronics and mechanical systems
- Understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- Understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- Gain knowledge of the Innovation & Product Development process in the Business Context

UNIT I   FUNDAMENTALS OF PRODUCT DEVELOPMENT   9
Global Trends Analysis and Product decision -   Social Trends -   Technical Trends- Economical Trends -   Environmental Trends - Political/Policy Trends -   Introduction to Product Development Methodologies and Management -   Overview of Products and Services - Types of Product Development -   Overview of Product Development methodologies - Product Life Cycle -   Product Development Planning and Management

UNIT II   REQUIREMENTS AND SYSTEM DESIGN   9
Requirement Engineering - Types of Requirements - Requirement Engineering - Traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design

UNIT III   DESIGN AND TESTING   9
Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation

UNIT IV   SUSTENANCE ENGINEERING AND END-OF-LIFE
**   (EOL)SUPPORT   9**
Introduction to Product verification processes and stages - Introduction to Product validation processes and stages - Product Testing standards and Certification - Product Documentation - Sustenance - Maintenance and Repair – Enhancements - Product EoL - Obsolescence Management - Configuration Management - EoL Disposal

UNIT V   BUSINESS DYNAMICS ENGINEERING SERVICES INDUSTRY   9
The Industry - Engineering Services Industry - Product development in Industry versus Academia - The IPD Essentials - Introduction to vertical specific product development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and S/W systems – Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

**   TOTAL: 45 PERIODS**
OUTCOMES:
The students will be able to
- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer
- Work independently as well as in teams
- Manage a project from start to finish

COURSE MATERIAL AND PEDAGOGY:
- NASSCOM has agreed to prepare / revise the course materials [selected teachers Anna University from major disciplines will be included in the process] as PPT slides for all theUNITS. The PPTs can be printed and given to each student if necessary at a Nominal Fee. This is the best possible material for this special course.
- NASSCOM will train the teachers of Anna University to enable them to teach this course. Atraining programme for nearly 3500 teachers needs to be organized. The team is exploring use of technology including the EDUSAT facility at Anna University.
- The course is to be offered as an elective to all UG Students both in the Constituent Colleges and Affiliated colleges of Anna University.

TEXT BOOKS [INDIAN ECONOMY EDITIONS]:
1. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, New Delhi, 2011
2. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, New Delhi, 2005.

REFERENCES:
1. Hiriyappa B, "Corporate Strategy – Managing the Business", Authorhouse, USA, 2013
2. Peter F Drucker, "People and Performance", Butterworth – Heinemann [Elsevier],Oxford, UK, 2004.
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Conceptsand Practice", Prentice Hall India, New Delhi, 2003
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design",McGraw Hill Education, Seventh Edition, New Delhi, 2013.

PTGE8071   **DISASTER MANAGEMENT**   **L T P C**
                                                                                3 0 0 3
OBJECTIVES:
- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I   INTRODUCTION TO DISASTERS   9
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II   APPROACHES TO DISASTER RISK REDUCTION (DRR)   9
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-

holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

**UNIT III   INTER-RELATIONSHIP BETWEEN DISASTERS AND
                       DEVELOPMENT   9**
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India -   Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV   DISASTER RISK MANAGEMENT IN INDIA   9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

**UNIT V   DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD
                      WORKS   9**
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

**   TOTAL: 45 PERIODS**
OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management

TEXT BOOK:
1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

PTGE8072   **HUMAN RIGHTS**   **L T P C**
                                                                    3 0 0 3

OBJECTIVES :
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I   **9**
Human Rights – Meaning, origin and Development.   Notion and classification of Rights – Natural, Moral and Legal Rights.   Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II   **9**
Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III   **9**
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV   **9**
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V   **9**
Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

                                                          TOTAL : 45 PERIODS
OUTCOMES:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:
1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.