PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

- Design of a 5-yr curriculum in CS targeting the 10+2 qualified students so as to bring up them as research scientists and high-tech technology solution providers. The objective is to develop a critical understanding about the diverse domains of studies, their analytical base and philosophy etc. Employ a content management system to develop a knowledge repository to be used for the on-line examinations and evaluations etc.

PROGRAMME OUTCOMES (POs):

- The programme is specifically designed for targeting the Research and Development, Teaching and Software developing in the field of Computer Science. This programme content is designed in such a way that it can mould candidates to get their job in IT Computers and other sectors. This programme aims at developing the software professionals to keep abreast of the most recent development in the field of Computer Science for the requirements of the dynamic and highly global environment of the present era. The curriculum based on enriching and sharpening software developing skills.
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*Director*

Centre For Academic Courses
Anna University, Chennai-600 025
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**Director**

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Anna University, Chennai-600 025
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**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

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</table>
OBJECTIVES

- To develop the four basic skills of language (reading, writing, speaking and listening) in order to acquire a creative and analytical mind that would fit into this new age of technological and global communication.
- To explore the various ways language is used effectively in day-to-day formal and informal contexts.
- To learn the appropriate form and structure essential for effective communication.

UNIT I

UNIT II
Listening for general understanding – Listening Comprehension – Comparative Language – Conversation: One to one – Introducing Others – Social Conversation – Initiating, carrying on and concluding a conversation – Place Description – Definition.

UNIT III

UNIT IV

UNIT V

TOTAL: 45 PERIODS

REFERENCES
3. English for Engineers and Technologists, Dept. of Humanities and Social Sciences, Anna University, Chennai: Orient Longman, 2006
UNIT I  DIFFERENTIAL CALCULUS  12
Representation of functions - New functions from old functions - Limit of a function - Limits at infinity - Continuity - Derivatives - Differentiation rules - Polar coordinate system - Differentiation in polar coordinates - Maxima and Minima of functions of one variable.

UNIT II  FUNCTIONS OF SEVERAL VARIABLES  12

UNIT III  INTEGRAL CALCULUS  12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV  MULTIPLE INTEGRALS  12

UNIT V  DIFFERENTIAL EQUATIONS  12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

TEXTBOOKS

REFERENCES
OBJECTIVES

• To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I PROPERTIES OF MATTER AND THERMAL PHYSICS  12

UNIT II ACOUSTICS AND ULTRASONICS  12

UNIT III QUANTUM PHYSICS  12
Black body radiation – Planck’s theory (derivation) – Photoelectric effect – Compton effect. theory and experimental verification – matter waves –Schrödinger wave equation in one dimension: time independent and time dependent equations – particle in a infinitely deep square well potential – finite well potential – tunnelling through barrier – applications.

UNIT IV SEMICONDUCTOR PHYSICS  12

UNIT V PHOTONICS AND FIBRE OPTICS  12
Spontaneous and stimulated emission - population inversion – Nd:YAG, CO2, semiconductor lasers - homojunction and heterojunction lasers - industrial applications. Principle and propagation of light in optical fibres – numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - fibre optical communication system.

OUTCOME

• The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXTBOOKS


REFERENCES

UNIT I  POLYMER IN ELECTRONICS  12

UNIT II  COMPOSITES  12

UNIT III  SPECIALITY MATERIALS  12

UNIT IV  FABRICATION OF INTEGRATED CIRCUITS  12
Introduction – Fabrication – MOS – NMOS, PMOS, CMOS, Ga-As Technologies, Printed circuit boards-Fabrication (Single layer only) – Lamination, printing (photo and screen printing) and mechanical operation.

UNIT V  BATTERIES  12
Primary and Secondary – Requirements – Commercial batteries – Dry Cell, acid cells, alkaline batteries (Ni-Cd), Li-ion. Fuels cells – (Hydrogen - oxygen) – UPS.

TOTAL: 60 PERIODS

TEXTBOOKS

REFERENCES
UNIT I  COMPUTER GENERATIONS AND CLASSIFICATIONS  12

UNIT II  DATA REPRESENTATION AND BINARY ARITHMETIC  12
Programming Languages - Data and Program representation - Creating computer program - Program Planning – Algorithms – Flow charts – Pseudo codes – Programming Paradigms – System Unit- CPU – Performance and improvement

UNIT III  INPUT/OUTPUT UNITS AND MEMORY DEVICES  12

UNIT IV  OPERATING SYSTEMS AND LANGUAGES  12

UNIT V  APPLICATION SOFTWARE AND NETWORK  12

TOTAL: 60 PERIODS

OUTCOMES
Upon successful completion of this course, students will be able to:
- comprehends the fundamental idea on various computing techniques
- know and learn to use the various soft wares assisting for the successful completion of a program
- Comprehend the intricacies involved when systems are connected in a network

TEXTBOOKS

REFERENCES

HS7161  COMMUNICATION SKILLS LABORATORY  L T P C
0 0 4 2

OBJECTIVES
- To develop the students’ language ability to a level that enables them to use English in their professional and academic environment
- To improve the communication skills of students seeking a career in IT industry
1. Listening Comprehension focusing on varying elements of vocabulary and structure
2. Video Comprehension developing combined audio-video receptive skills to deduce meaning from context - Use of online resources – Making short speeches
3. Seminar skills - agreeing and disagreeing, clarifying, questioning, persuading, emphasizing, concluding, interrupting; evaluating ideas and actions, presenting solutions, recommending action, comparing and contrasting, probability and possibility, cause and effect, criticizing - Group Discussion Activities on current issues – Presenting your viewpoints
4. Listening Comprehension of authentic materials – Self-instruction using listening and video materials from the self access language laboratory with comprehension exercises.
5. Use of the Internet to extract authentic materials on specific areas of interest

TOTAL: 60 PERIODS

REFERENCES
2. Newspapers and Technical Magazines can be used for reference.

XC7161 COMPUTING LABORATORY

a) WORD PROCESSING
1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
4. Drawing - flow Chart
5. LaTex Basics

b) SPREAD SHEET
6. Chart - Line, XY, Bar and Pie.
7. Formula - formula editor.
8. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
9. Sorting and Import / Export features.

c) DATABASE
10. Creating and Manipulating MS-ACCESS File.

TOTAL: 60 PERIODS

HS7252 TECHNICAL COMMUNICATION

OBJECTIVES
- To develop the essential language skills needed to present technical material in oral and written form.
- To introduce different forms of technical material and help students learn the required skills to listen/read, write, understand and speak about such technical material.

UNIT I
Reading Comprehension of Authentic Materials - Reading for real life context - Listening to different accents & understanding - Communicative & decision making activities based on authentic reading materials - Language Functions: agreeing, disagreeing, expressing likes & dislikes etc - Written communication tasks for authentic task oriented goals - Types of writing - process writing, Evaluative & Analytical Writing - Homophones - British / American Vocabulary - Framing Questions: Auxiliary Verbs, Question Tags.
UNIT II

UNIT III
Reading Technical Documents & interpreting them - Listening to follow instructions – Note taking Exercises - Analysing problems & offering solutions - Presenting statistical information - Presenting numbers & figures – Role play -Mock Interviews - Job Application with CV - Writing a project proposal - Writing a post for a discussion forum - Compound Words - Time, Quality, Cost & Numbering Vocabulary - Numerical Expressions.

UNIT IV
Reading Reports & Analysing them - Reading for Specific Purposes - Listening to tonal inflections - Listening & Responding - Listening for collecting information - Information gathering activities concerning time, place, cost and personal description - Discussion on blog post or about discussion forum - Report Writing - Letter to Editor - Taking part in an online conversation - Blog entry - Reported Speech - Editing & Error Correction.

UNIT V

TOTAL: 45 PERIODS

REFERENCES

MA7252 DISCRETE MATHEMATICS L T P C
UNIT I MATHEMATICAL LOGIC I 12

UNIT II MATHEMATICAL LOGIC II 12
Predicate Calculus – Inference theory for statement calculus and predicate calculus – Mathematical Induction.

UNIT III RELATIONS AND FUNCTIONS 12

UNIT IV GROUPS 12
Groups – Definitions and Examples – Subgroups and Homomorphism – Cosets and Lagrange’s theorem – Normal Subgroups – Group Codes.
UNIT V  LATTICES  12
Posets – Lattices – Properties of Lattices – Lattices as Algebraic System – Some Special Lattices –
Boolean algebra.

TEXTBOOKS
1. Tremblay J.P. and Manohar, R., “Discrete Mathematical Structures with Applications to Computer
   [Sections : 1-2.1 to 1-2.4, 1-2.6 to 1-2.14, 1-3; 1-4.1 to 1-4.3, 1-5, 1-6.4 and 1-6.5, 2-5.1; 3-5.1 to 3-5.4, 3-7.2 to 3-7.3; 4-1, 4-2]
   [Sections: 2.3, 7.1, 7.3-7.5]

REFERENCES
New Delhi, 2009.
REFERENCES

XC7251 DIGITAL SYSTEMS

OBJECTIVES
- To Introduce the basic concept of digital and binary systems
- To Give students the concept of digital logic design
- To Give students the basic tools for the design and implementation of digital modules and subsystems
- To Reinforce theory and techniques taught in the classroom through project assignments.

UNIT I NUMBER SYSTEMS AND BINARY CODES

UNIT II BOOLEAN ALGEBRA AND LOGIC GATES

UNIT III GATE-LEVEL MINIMIZATION

UNIT IV COMBINATIONAL LOGIC

UNIT V SEQUENTIAL LOGIC

OUTCOMES
Upon successful completion of this course, students will be able to:
- Apply knowledge of math, science and engineering.
- Design digital circuitry, analyze and interpret data.
- Design a system, component, process to meet desired needs within realistic constraints.

TOTAL: 45 PERIODS

Attested
DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025
TEXTBOOK

REFERENCES

XC7252 PROGRAMMING IN C

OBJECTIVES
- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

UNIT I FUNDAMENTALS AND INPUT/OUTPUT STATEMENTS
- Constants
- Variables
- Data types
- Operators
- Expressions
- Library functions
- Standard Input/Output functions

UNIT II CONTROL STATEMENTS, FUNCTIONS AND STORAGE CLASSES
- While, do-while, for, if-else, switch and go to statements
- break and continue statements
- Defining a function
- Accessing a function
- Passing arguments to a function
- Recursion
- Automatic, External and Static variables

UNIT III ARRAYS AND POINTERS
- Defining and processing an array
- Passing arrays to a function
- Multi-dimensional arrays
- Pointer declarations
- Passing pointers to a function
- Pointers and arrays
- Operations on printers
- Arrays of pointers
- Passing functions to other functions

UNIT IV STRUCTURES AND UNIONS
- Defining a structure
- Processing a structure
- User-defined data type
- Structure and pointers
- Passing structures to a function
- Self-referential structures
- Unions

UNIT V FILE HANDLING
- File Creation
- Opening & Closing files
- Read, Write, Appending data
- ftell() and fseek()
- File I/O
- Command line arguments

TOTAL: 45 PERIODS

OUTCOMES
Upon successful completion of this course, students will be able to:
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in ‘C’ language
- Write small programs related to simple/moderate mathematical, and logical problems in ‘C’.
- Study, analyze and understand simple data structures, use of pointers, memory allocation and data handling through files in ‘C’.

19
TEXTBOOKS

REFERENCE

XC7261  DIGITAL SYSTEMS LABORATORY  L T P C
0 0 4 2
1. Study of logic gates
2. Simplification of Boolean expressions using K-maps
3. Adders - Subtractors
4. Code Converters
5. Multiplexers - Demultiplexers
6. Comparators
7. Parity Checkers
8. Construction of Flip Flops using logic gates
9. Study of Flip-flops using IC’s
10. Shift Registers
11. Counters

TOTAL: 60 PERIODS

XC7262  PROGRAMMING IN C LABORATORY  L T P C
0 0 4 2
1. Input/Output statements
2. Control functions
3. Functions with recursion
4. Arrays
5. Pointers
6. Structures and Unions
7. File Handling

TOTAL: 60 PERIODS

[Signature]
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Centre For Academic Courses
Anna University, Chennai-600 025.
UNIT I  ANALYTIC FUNCTIONS  
Function of a complex variable – Analytic function – Cauchy-Riemann Equations – Properties of analytic functions – Construction of Analytic Functions - Conformal mapping of $w = z + a$, $w = 1/z$, $w = cz$, $w = z^2$, $w = e^z$ and Bilinear transformations.

UNIT II  COMPLEX INTEGRATION  

UNIT III  Z-TRANSFORM  
Transforms of elementary sequences – Unit Step and impulse functions – Properties – Initial and Final Value Theorems - Convolution Theorem – Inverse Z-transform – Application to linear difference equations with constant coefficients.

UNIT IV  FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS  

UNIT V  HIGHER ORDER PARTIAL DIFFERENTIAL EQUATIONS  
Homogeneous linear equations with constant coefficients – Complementary function – Particular integral – Non-homogeneous linear equations.

TOTAL: 60 PERIODS

TEXTBOOK  

REFERENCES  

OBJECTIVES  
- To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions.
- To allow to assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- To choose the appropriate data structure and algorithm design method for a specified application.
To learn the systematic way of solving problems, various methods of organizing large amounts of data.
To efficiently implement the different data structures and solutions for specific problems

UNIT I
STACKS AND RECURATION
Arrays, Structures and Stacks – Recursion.

UNIT II
QUEUES AND LISTS
Queue and its sequential representation, Linked lists, Lists, Circular Linked lists.

UNIT III
GRAPHS AND TREES

UNIT IV
SORTING
Exchange sorts – Selection and Tree sorting – Insertion sorts – Merge sort.

UNIT V
SEARCHING
Basic Search Technique (except Interpolation search) – Tree Searching (except Balance Trees) – Hashing - Open Addressing – Deleting Items.

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- understand the properties of various data structures
- identify the strengths and weaknesses of different data structures
- design and employ appropriate data structures for solving computing problems

TEXTBOOK
   [Chapter 1 : Sections 1.2, 1.3, Chapter 2, Chapter 3 : Sections 3.1 to 3.3, Chapter 4 : Sections 4.1 to 4.3 and 4.5, Chapter 5 : Sections 5.1, 5.2 and 5.5, Chapter 6 :Sections 6.2 to 6.5, Chapter 7 : Sections 7.1, 7.2 and 7.4 (topics mentioned in the syllabus alone), Chapter 8: Section 8.1 (excluding Warshall’s algorithm, Shortest Path algorithm), Section 8.3 (Only Linked list representation)]

REFERENCE

XC7352
DATABASE MANAGEMENT SYSTEMS
L T P C
3 0 0 3

OBJECTIVES
- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
UNIT I DATABASE SYSTEM CONCEPTS

UNIT II RELATIONAL DATABASE SYSTEM DESIGN
Relational Algebra – Tuple and Domain Relational Calculus – SQL – Views – Triggers – Domain Constraints – Referential Integrity

UNIT III NORMALIZATION
Functional Dependencies – Inference rules – Decomposition – Properties – Normal Forms (NF) – First NF, Second NF, Third NF, Boyce-Codd NF, Fourth NF, and Fifth NF.

UNIT IV DATA STORAGE AND QUERYING

UNIT V TRANSACTION MANAGEMENT

TOTAL: 45 PERIODS

OUTCOMES
Upon successful completion of this course, students will be able to:
- Distinguish unary, binary, and ternary relationships and give a common example of each.
- Draw an E-R diagram to represent common business situations
- Compare and contrast the object oriented model with the E-R and EER models
- Explain the properties of relations
- Discuss the first normal form, second normal form, and third normal form
- Use normalization to decompose our relation with anomalies into well structured relations
- Describe the physical database design process, its objectives, and deliverables
- Explain how to select an appropriate file organization by balancing various important design factors

TEXTBOOK

REFERENCES
OBJECTIVES

- To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

UNIT I INTRODUCTION AND INTEL 8085

UNIT II 16 – BIT PROCESSORS (INTEL 8086)
Intel 8086: Architecture – addressing modes and Instruction format interfacing of memory & I/O device – odd and even addressed blanks – storing/retrieval of 16 bit data at an odd address – Simple Programs.

UNIT III INTRODUCTION TO MICROCONTROLLERS

UNIT IV INTERFACING BASICS
On controlling/monitoring continuous varying (analog) non-electrical signal using microprocessor/microcontrollers need for interfacing ICs – thumb wheel switch as input devices – single LED, seven segment LED as output devices – interfacing these using both memory mapped I/O and peripheral mapped I/O - D/A, A/D ICs and their signals – sample and hold IC and its usage.

UNIT V INTERFACING ICs
(i) 8255 - Programmable Peripheral Interface along with 8085
(ii) 8254 – Programmable Interval Timer along with Intel 8086
(iii) Need for the following ICs: (a) 8251 – USART; (b) 8257 – Direct Memory Access Controller; (c) 8259 – Programmable Interrupt Controller; (d) 8279 – Keyboard / Display Interface.
(iv) 8085 and 8051 based industrial automations

TOTAL (45 + 30) : 75 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- Learn the internal organization of some popular microprocessors/microcontrollers.
- Learn hardware and software interaction and integration.
- Learn the design of microprocessors/microcontrollers-based systems.

TEXTBOOK

REFERENCES
OBJECTIVES

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.

UNIT I OOP AND C++ FUNDAMENTALS
Object-oriented paradigm - Elements of object oriented programming – Merits and demerits of OO methodology - Characteristics of OOP - C++ data types - Operators - Expressions- Pointers - References - Enumeration - Classes.

UNIT II CLASSES
Classes and Objects - Members and Member function - This pointer Constructors and Destructors – Friend functions - Template classes - New and Delete operators.

UNIT III FUNCTIONS IN C++

UNIT IV INHERITANCE
Derived class - Single Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance - Virtual Functions - Virtual Base class - Nesting of classes.

UNIT V INPUT/OUTPUT
Input/Output operations - I/O stream classes – Overloading the insertion and extraction operators - File input/output - Exception handling-command line arguments.

OUTCOMES

Upon completion of the subject, students will be able to:
- prepare object-oriented design for small/medium scale problems
- demonstrate the differences between traditional imperative design and object-oriented design
- explain class structures as fundamental, modular building blocks
- understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code
- write small/medium scale C++ programs with simple graphical user interface
- use classes written by other programmers when constructing their systems

TEXTBOOKS

REFERENCES
XC7361

DATA STRUCTURES LABORATORY

1. Arrays and structures in C
2. Infix, Postfix, Prefix expressions using Stack
3. Linked list, Circular Linked list
4. Queues as Circular list
5. Representations of Graphs
6. Operation on binary trees
7. Insert sort, Quick Sort, Heap Sort
8. Sequential Search and Binary Search
9. Index based search

TOTAL: 60 PERIODS

XC7362

DATABASE MANAGEMENT SYSTEMS LABORATORY

1. DDL, DML, DCL
2. Subquery, Set functions
3. Date, Time, String functions
4. Nested Queries
5. Single row functions, Group functions
6. Joins – Left, Right, Full, Equi
7. Index, Views
8. PL/SQL Functions (or equivalent)
9. Procedures
10. Triggers

TOTAL: 60 PERIODS

REFERENCE


XC7363

OBJECT ORIENTED PROGRAMMING LABORATORY

1. Create a complex number class with all possible operators
2. Static members, Friend functions.
3. Operator overloading, overloading of assignment operator
4. Type conversions such as integer to complex, double to complex, complex to double.
5. Constructor, Destructor, Copy constructor.
6. Virtual functions
7. Matrix class with operator overloading
8. Single, Multiple and Hybrid Inheritance
9. Polymorphism
10. Exception Handling
11. Input/Output file handling

**TOTAL: 60 PERIODS**

**XC7451 COMBINATORICS AND GRAPH THEORY**

<table>
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<tr>
<th>UNIT I</th>
<th>FUNDAMENTAL PRINCIPLES OF COUNTING</th>
<th>L T P C</th>
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**UNIT II GENERATING FUNCTIONS AND RECURRENCE RELATIONS**


**UNIT III AN INTRODUCTION TO GRAPH THEORY**

Definitions and Examples – Subgraphs, Complements and Graph Isomorphism – Euler Trails and Circuits – Planar graphs – Hamilton Paths and Cycles.

**UNIT IV TREES**


**UNIT V OPTIMIZATION AND MATCHING**

Shortest path Algorithm – Minimal spanning Tree Algorithms – The Max-flow Min-Cut Theorem.

**TOTAL: 60 PERIODS**

**TEXTBOOK**

   [Sections: 1.1 to 1.4, 5.5, 8.1 to 8.3; Chapter 9, 10.1, 10.2, 10.4; 11.1 to 11.5; Chapter 12; Chapter 13]

**REFERENCES**

OBJECTIVES

- To teach students fundamental knowledge in Computer Architecture.
- To cover the basic organizations of computer systems including instruction set architecture, pipeline, memory hierarchy and I/O subsystem.

UNIT I  STRUCTURE OF COMPUTERS  9

UNIT II  ARITHMETIC AND LOGIC UNIT  9
Binary Addition and Subtraction – Binary Multiplication and Division – Booth Algorithm – Fixed Point Representations – Floating Point Representation – Floating Point Arithmetic Operations – Arithmetic Pipelining – Bit-Sliced ALU

UNIT III  CONTROL UNIT  7
Hardwired and Micro programmed Control – Control Memory – Address Sequencing – Micro instruction Sequencing - Macro instruction Execution - Program Control

UNIT IV  MEMORY ORGANIZATION  10

UNIT V  INPUT OUTPUT ORGANIZATION AND ADVANCED ARCHITECTURE  10

OUTCOMES
Upon completion of the subject, students will be able to:

- Understand the fundamentals of different instruction set architectures and their relationship to the CPU design.
- Understand the principles and the implementation of computer arithmetic.
- Understand the operation of modern CPUs including pipelining, memory systems and buses.
- Understand the principles of operation of multiprocessor systems and parallel programming.

TEXTBOOKS

REFERENCES
OBJECTIVES

- To help you to understand some fundamental basic concepts behind the Java technology.
- To understand how to use Java to create, access, and support Java applications and applets.
- To discuss the portability features of Java and how they are changing the way Web users access applications at the desktop level.

UNIT I  JAVA FUNDAMENTALS


UNIT II  APPLETS AND GUI


UNIT III  THREADING, NETWORKING


UNIT IV  MARKUP AND SCRIPTING LANGUAGES


UNIT V  SERVER SIDE PROGRAMMING


TOTAL: 45 PERIODS

OUTCOMES

Upon completion of this course, students would be able to:

- Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifiers, automatic documentation through comments, error exception handling)
- Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing.
- Develop programs using the Java Collection API as well as the Java standard class library.

TEXTBOOKS

REFERENCES

XC7454 OPERATING SYSTEMS

OBJECTIVES
- To provide a clear understanding of the concepts that underlie operating systems.
- Fundamental concepts and algorithms that will be covered are based on those used in existing commercial operating systems.
- To present these topics in a general setting that is not tied to one particular operating system.
- Throughout the course, practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows, and some instructional operating systems will be studied as well.

UNIT I INTRODUCTION AND PROCESSES

UNIT II PROCESS MANAGEMENT
Threads – Multithreading Models – Threading Issues – Critical-Section Problem – Synchronization Hardware - Semaphores – Classic Problems of Synchronization — Monitors - CPU scheduler – Scheduling criteria – Scheduling algorithms – Multiple-Processor Scheduling

UNIT III DEADLOCKS, MEMORY MANAGEMENT AND VIRTUAL MEMORY

UNIT IV FILE SYSTEM

UNIT V CASE – STUDY : LINUX AND WINDOWS OPERATING SYSTEMS

TOTAL: 45 PERIODS
OUTCOMES
Upon completion of the subject, students will be able to:

- gain extensive knowledge on principles and modules of operating systems
- understand key mechanisms in design of operating systems modules
- understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks
- compare performance of processor scheduling algorithms - produce algorithmic solutions to process synchronization problems
- use modern operating system calls such as Linux process and synchronization libraries
- practice with operating system concepts such as process management, synchronization, networked processes and file systems

TEXTBOOK

REFERENCES

XC7455 THEORY OF COMPUTATION

OBJECTIVES
- To provide an understanding of basic concepts in the theory of computation.
- To study push down Automata, Turing machines, universal computation and general undecidability.
- To develop knowledge and the core expertise in Theory of Computation.
- To assess via formal reasoning through computing to solve problems in science and engineering.

UNIT I REGULAR SETS AND FINITE STATE AUTOMATA
Finite State Automata – Deterministic and Non-deterministic models – Languages accepted by Finite State Automata – Regular Expression - Pumping Lemma for regular set.

UNIT II CONTEXT FREE LANGUAGES

UNIT III PUSHDOWN AUTOMATA

UNIT IV TURING MACHINES AND UNDECIDABILITY
Turing Machine model – Computational languages and functions – Modifications of Turing Machines (only descriptions, no proof for theorems on equivalence of the modifications). – Properties of recursive and recursively enumerable languages – Universal Turing Machines and the undecidable problems.
UNIT V  THE CHOMSKY HIERARCHY


TOTAL : 60 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:

- construct finite state machines and the equivalent regular expressions.
- prove the equivalence of languages described by finite state machines and regular expressions.
- construct pushdown automata and the equivalent context free grammars.
- prove the equivalence of languages described by pushdown automata and context free grammars.
- construct Turing machines and Post machines.
- prove the equivalence of languages described by Turing machines and Post machines.
- create finite machine that accepts the complex real world problems.
- solve the complex problems using universal Turing machine.
- understand the computational complexity of various problems.
- formalize mathematical models of computations; use these formalisms to explore the inherent limitations of computations; and describe some major current approaches to investigate feasible computation.

TEXTBOOK

REFERENCES

XT7451  CRYPTOGRAPHY AND DATA SECURITY L T P C
3 0 0 3

OBJECTIVES
- To introduce the students to basic number theory concepts and algorithms related to cryptography.
- To study variety of existing crypto-systems and develop problem-solving skills for cryptographic problems and applications.
- To introduce to the students the science and study of methods of data protection computer and communication systems from unauthorized disclosure and modification,
- To show how to develop techniques for verification, identification, key safeguarding schemes and key distribution protocols and
- To introduce students to different methods of encrypting data for security purposes

UNIT I  INTRODUCTION TO NUMBER THEORY
UNIT II CONVENTIONAL ENCRYPTION

UNIT III PUBLIC KEY CRYPTOGRAPHY AND DIGITAL SIGNATURES

UNIT IV MESSAGE AUTHENTICATION
MAC functions, Hash functions – Authentication requirements – authentication functions – Authentication Mechanisms Using Hash and MACs – Secure Hash Algorithms-SHA-3 --- HMAC, CMAC.

UNIT V NETWORK SECURITY

OUTCOMES
Upon completion of the subject, students will be able to:
- explain basic concepts in number theory and apply modular arithmetic in problem solving
- understand the setups, the protocols, and the security issues of some existing cryptosystems
- examine the security of a given cryptosystem
- Implement some simple cryptographic schemes.

TOTAL: 45 PERIODS

TEXTBOOK

REFERENCES

XC7461 JAVA AND INTERNET PROGRAMMING LABORATORY
1. Java Classes and Objects
2. Inheritance and Polymorphism
3. Packages, Interfaces and Exception Handling
4. GUI Programming (AWT,Swings,Applets)
5. Multi-threaded Applications
6. Socket Programming in Java
7. RMI
8. Client side scripting (HTML 5, XML, AJAX, JSON)
9. Server side scripting (JDBC, JSP)

TOTAL: 60 PERIODS

**XC7462 OPERATING SYSTEMS LABORATORY**

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1. Basic LINUX commands
2. Shell programming
3. Filters – grep, sed, awk
4. Introduction to C programming with Linux (cc, Makefile, gdb)
5. File Systems - create, open, read, write, close, lseek, stat
6. Process management - Fork, Exec commands, Wait
7. Semaphores
8. Interprocess Communication
9. Simulation of Deadlock
10. Simulation of Scheduling algorithms

TOTAL: 60 PERIODS

**MA7551 APPLIED STATISTICS**

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**UNIT I ESTIMATION THEORY**


**UNIT II THEORY OF HYPOTHESIS**

Sampling distributions: Normal, students-t, $\chi^2$ and F distributions – Test based on Normal, students-t, $\chi^2$ and F distributions for testing of mean, Variance and Proportions – Analysis of r x c Contingency tables – Goodness of fit.

34
UNIT III  NON-PARAMETRIC TESTS

UNIT IV  CORRELATION AND REGRESSION
Multiple and Partial Correlation – Method of Least squares – Plane of Regression – Properties of Residuals – Coefficient of multiple correlation – Coefficient of Partial Correlation – Multiple Correlation with total and partial correlations – Regression and partial correlation in terms of lower order correlations.

UNIT V  DESIGN OF EXPERIMENTS
Analysis of variance – One way and two-way classification – Completely Random Design – Randomized Block Design – Latin Square Design.

TOTAL: 60 PERIODS

TEXTBOOKS

REFERENCES

XC7551  COMPUTER NETWORKS  L T P C
3 0 0 3

OBJECTIVES
- To Build an understanding of the fundamental concepts of computer networking.
- To Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- To Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- To Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

UNIT I  FUNDAMENTALS OF NETWORKING

UNIT II  MAC LAYER
UNIT III  NETWORK LAYER

UNIT IV  TRANSPORT LAYER

UNIT V  APPLICATION LAYER

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
- Identify the different types of network devices and their functions within a network
- Understand and build the skills of subnetting and routing mechanisms.
- Familiarize with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.

TEXTBOOKS

REFERENCES
UNIT II  SORTING  12

UNIT III  GRAPH ALGORITHMS  12

UNIT IV  STRING MATCHING  12

UNIT V  NP COMPLETENESS  12

OUTCOMES
Upon successful completion of this course, students should be able to:
• prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains;
• apply the algorithms and design techniques to solve problems
• analyze the complexities of various problems in different domains.

TEXTBOOK
   Chapters 2, 3, 6, 23; Sections: 1.1, 4.1 to 4.3, 7.1, 7.2, 8.1, 22.1 to 22.4, 24.3, 32.1, 32.3, 32.4, 34.1, to 34.3, 34.5.1, 34.5.4.

REFERENCES

XC7553  SOFTWARE ENGINEERING  L T P C
3 0 0 3

OBJECTIVES
• to assist the student in understanding the basic theory of software engineering, and
• to apply these basic theoretical principles to a group software development project.

UNIT I  INTRODUCTION  9
UNIT II SOFTWARE PROCESS MODELS

UNIT III SOFTWARE PROJECT MANAGEMENT AND REQUIREMENT ENGINEERING

UNIT IV SOFTWARE DESIGN AND TESTING

UNIT V SOFTWARE COST ESTIMATION AND QUALITY

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- Perform background research and a feasibility study prior to embarking on a development project.
- apply the waterfall software development lifecycle model to a development project.
- know how and when to adapt or replace the waterfall lifecycle model by other alternatives, including user-centred development and iterative lifecycle models.
- collect and analyse user requirements using a formalism such as UML, including business process modeling.
- Perform a simple risk assessment for a development project.
- should be able to structure this information in a User Requirements Document (URD).
- translate end-user requirements into system and software requirements, using e.g. UML.
- identify and apply appropriate software architectures and patterns to carry out high level design of a system.
- work in a team to implement a project plan, URD, SRD and ADD, by developing detailed designs and code.

TEXTBOOK

REFERENCES
OBJECTIVES
- To create a clean, consistent repository of data within a data warehouse for large corporations;
- To utilize various techniques developed for data mining to discover interesting patterns in large databases;
- To expose students to new techniques and ideas that can be used to improve the effectiveness of current data mining tools.

UNIT I DATA WAREHOUSING

UNIT II DATA MINING & ASSOCIATION RULE MINING

UNIT III CLASSIFICATION & PREDICTION
Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor.

UNIT IV CLUSTER ANALYSIS
Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V APPLIED DATA MINING
Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

OUTCOMES
Upon completion of the subject, students will be able to:
- understand why there is a need for data warehouse in addition to traditional operational database systems;
- identify components in typical data warehouse architectures;
- design a data warehouse and understand the process required to construct one;
- understand why there is a need for data mining and in what ways it is different from traditional statistical techniques;
- understand the details of different algorithms made available by popular commercial data mining software;
- solve real data mining problems by using the right tools to find interesting patterns;
- understand a typical knowledge discovery process such as CRISP-DM;
- obtain hands-on experience with some popular data mining software.
TEXTBOOKS

REFERENCES

XT7561 DATA MINING AND WAREHOUSING LABORATORY
L T P C 0 0 4 2
SPSS, Clementine – Tools for Data Mining – Classification – Regression – Clustering – Summarization and dependency modeling – Change and deviation detection – Visualization – Using data mining tools for different application.
TOTAL: 60 PERIODS

XT7562 GUI APPLICATIONS LABORATORY
L T P C 0 0 4 2
1. Dialog based applications with common controls and ActiveX Controls
2. Applications with menus and toolbars
3. Database Applications to Add, Delete, Modify and View Records
4. Applications with document/view architecture (SDI, MDI )
5. Applications with serialization
6. Database connectivity.
7. Application of all above concepts.
TOTAL : 60 PERIODS
MA7651 PROBABILITY, QUEUEING THEORY AND RELIABILITY  

UNIT I  ONE – DIMENSIONAL RANDOM VARIABLES  

UNIT II  TWO-DIMENSIONAL RANDOM VARIABLES  
Joint distribution – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Conditional expectations – Regression curve.

UNIT III  QUEUEING MODELS  
Markovian Queues: M/M/1 and M/M/C infinite and finite capacity waiting line queueing models – Little’s formula – Finite source queueing model.

UNIT IV  ADVANCED QUEUEING MODELS  
M/G/1 queue (P-K formula) : M/D/1 and M/G/1 as special cases – Series (Tandem) queueing model – Open Jackson queueing network – Closed queueing network.

UNIT V  RELIABILITY MODELS  

TOTAL: 60 PERIODS

TEXTBOOKS

REFERENCES
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 DISTRIBUTED DATABASES

UNIT II ELEMENTARY TCP SOCKETS

UNIT III APPLICATION DEVELOPMENT

UNIT IV SOCKET OPTIONS, ELEMENTARY UDP SOCKETS

UNIT V ADVANCED SOCKETS

OUTCOMES
Upon completion of the subject, students will be able to:
- understand TCP/IP networking
- understand the design considerations in building network applications.
- Will gain an in-depth knowledge of Berkley sockets and the system calls needed to support network programming.
- Will achieve a greater understanding of WIN32 and/or UNIX programming. E.g. Multi-threaded coding.

REFERENCES
OBJECTIVES
- To understand computational development of graphics with mathematics
- To provide in-depth knowledge of display systems, image synthesis, shape modeling of 3D application.
- To Understand basic concepts related to Multimedia including data standards, algorithms and software
- To Experience development of multimedia software by utilizing existing libraries and descriptions of algorithms

UNIT I OVERVIEW OF COMPUTER GRAPHICS AND MULTIMEDIA

UNIT II OUTPUT PRIMITIVES AND 2D TRANSFORMATIONS

UNIT III 3D GRAPHICS

UNIT IV MULTIMEDIA TOOLS AND COMMUNICATIONS

UNIT V MULTIMEDIA INFORMATION REPRESENTATION

OUTCOMES
Upon completion of the subject, students will be able to:
- Students will demonstrate an understanding of contemporary graphics hardware.
- Students will create interactive graphics applications in C++ using one or more graphics application programming interfaces.
- Students will write program functions to implement graphics primitives.
- Students will write programs that demonstrate geometrical transformations.
- Students will demonstrate an understanding of the use of object hierarchy in graphics applications.
- Students will write program functions to implement visibility detection.
- Students will write programs that demonstrate computer graphics animation.
- Students will write programs that demonstrate 2D and 3D image processing techniques.
TEXTBOOKS

REFERENCES

XC7652 OBJECT ORIENTED ANALYSIS AND DESIGN

OBJECTIVES
- To learn the concept of Object Oriented Software Development Process
- To get acquainted with UML Diagrams
- To understand Object Oriented Analysis Processes

UNIT I INTRODUCTION
Overview of OO Systems Development – Object basics – OO Systems development life cycle – OO methodologies:

UNIT II STATIC AND DYNAMIC MODELLING IN UML

UNIT III OBJECT ORIENTED ANALYSIS

UNIT IV OBJECT ORIENTED DESIGN – I

UNIT V OBJECT ORIENTED DESIGN – II
View Layer: Designing Interface Objects – Purpose of View Layer Interface – Prototyping the User Interface – Case Studies: Inventory Control System; Library Management System; Hospital Management System; Online Examination System; Online Railway Reservation System.

TOTAL: 45 PERIODS
OUTCOMES
Upon completion of the subject, students will be able to:

- Master the fundamental principles of OO programming
- Master key principles in OO analysis, design, and development
- familiarize with the application of the Unified Modeling Language (UML) towards analysis and design
- Master common patterns in OO design and implement them
- familiarize with alternative development processes

TEXTBOOKS

REFERENCES

GE7651 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

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, ecotone, ecological niche – 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 – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – 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- oil 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, Tsunami, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.
UNIT III  NATURAL RESOURCES
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

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES

XC7661  CASE TOOLS LABORATORY

OBJECTIVES
- To learn the fundamentals of Object Oriented Analysis and Design concepts and experienced using UML diagrams - generate source code – identifies the deliverables of the problem defined. Use case diagram- Class diagram-Interaction diagram- State transition diagram- Component and Deployment diagram.
Suggested List of Domains
1. Stock maintenance
2. Passport automation system
3. Book bank
4. Software personnel management system
5. E-ticketing
6. BPO Management System
7. Conference Management System

OUTCOMES
1. Design and implement projects using object oriented concepts.
2. Create code from design.

TOTAL: 60 PERIODS

XC7662  COMPUTER GRAPHICS AND MULTIMEDIA LABORATORY   L T P C
0 0 4 2

The above exercises are to be carried out in open GL environment.

Tweened Animation- Motion tween – Motion along open/closed guided path - Shape tween – Size tween – Color Tween – morphing – Fractal drawing – Image editing tool –Audio and Video Editing tools.

Mini project

TOTAL: 60 PERIODS

MA7851  NUMERICAL METHODS   L T P C
4 0 0 4

UNIT I  SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

UNIT II  INTERPOLATION
Newton’s divided difference formula, Lagrange’s formula. Newton’s forward and backward difference formulae, Natural Cubic Spline.
UNIT III  NUMERICAL DIFFERENTIATION AND INTEGRATION  12
Numerical differentiation with interpolating polynomials, Numerical integration by Trapezoidal and Simpson’s 1/3\textsuperscript{rd} rule. Double integrals using Trapezoidal and Simpson’s rules.

UNIT IV  INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS  12

UNIT V  BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS  12
Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation (explicit scheme), one dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL : 60 PERIODS

TEXTBOOK

REFERENCES

XC7851  MACHINE LEARNING TECHNIQUES  L T P C  3 0 0 3

OBJECTIVES
- To enable students to understand different techniques like task oriented studies, cognitive simulation and theoretical analysis for machine learning

UNIT I  INTRODUCTION  9

UNIT II  SUPERVISED LEARNING  9
UNIT III  UNSUPERVISED LEARNING 9

UNIT IV  PROBABILISTIC GRAPHICAL MODELS 9

UNIT V  ADVANCED LEARNING 9

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- set up a well-defined learning problem for a given task
- select and define a representation for data to be used as input to a machine learning algorithm
- select and define a representation for the model to be output by a machine learning algorithm
- compare different algorithms according to the properties of their inputs and outputs
- compare different algorithms in terms of similarities and differences in the computational methods used
- develop and describe algorithms to solve a learning problem in terms of the inputs, outputs and computational methods used
- express key concepts from the foundations of computational and statistical learning theory and demonstrate their applicability
- express knowledge of general capabilities and limitations of machine learning from computational and statistical theory
- use or extend or invent algorithms in applications to real-world data sets and collect results to enable evaluation and comparison of their performance

REFERENCES
OBJECTIVES
- To understand the phases of the compilation process and be able to describe the purpose and implementation approach of each phase.
- To provide a practical exposure to aspects of theoretical computer science including Languages, Grammars, and Machines.
- To Exercise and reinforce prior programming knowledge with a non-trivial programming project to construct a compiler.

UNIT I INTRODUCTION AND LEXICAL ANALYSIS 7

UNIT II SYNTAX ANALYSIS AND INTERMEDIATE CODE GENERATION 11

UNIT III RUN–TIME ENVIRONMENT 9

UNIT IV CODE GENERATION 9

UNIT V MACHINE-INDEPENDENT OPTIMIZATIONS 9

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- Design and implement techniques used for optimization by a compiler.
- Modify the existing data structures of an open source optimizing compiler.
- Design and implement new data structures and algorithms for code optimisation. Critically analyze different data structures and algorithms used in the building of an optimizing compiler.

TEXTBOOK

REFERENCES
OBJECTIVES

- To present the concepts, techniques and metrics for quality assurance in software development.
- To develop a good understanding of issues, techniques and tools for software testing.
- To enable students to gain a working knowledge of techniques for management of testing projects.

UNIT I  INTRODUCTION TO SOFTWARE QUALITY  8

UNIT II  SOFTWARE QUALITY METRICS AND RELIABILITY  9

UNIT III  TEST CASE DESIGN  11

UNIT IV  TEST MANAGEMENT  9

UNIT V  CONTROLLING AND MONITORING  8

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the subject, students will be able to:

- appreciate the importance of software quality assurance;
- apply software testing techniques for information systems development;
- know the inputs and deliverables of the testing process;

TEXTBOOKS

REFERENCES

XT7851 CLOUD COMPUTING

OBJECTIVES
- To introduce the broad perspective of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To understand the features of cloud simulator
- To apply different cloud programming models as per need.
- To be familiar with the lead players in cloud.
- To learn to design the trusted cloud Computing system

UNIT I INTRODUCTION
Evolution of cloud computing – Need for cloud computing - Benefits - Limitations - Migration into Cloud - Basics of virtualization - Desktop virtualization - Server virtualization - Case study: VMware - Basics of web services - Key concepts

UNIT II CLOUD ARCHITECTURE

UNIT III ISSUES IN CLOUD
Federation in cloud - Four levels of federation - Privacy in cloud - Security in cloud - Software-as-a-Service security - Case study: Aneka - Service level agreements

UNIT IV CLOUD STORAGE
Overview of cloud storage - Cloud storage providers - Case studies: Walrus - Amazon S3 - Cloud file system – Map Reduce - Case study: Hadoop

UNIT V CLOUD DEPLOYMENT TOOLS
Study of open source cloud platforms - Eucalyptus - Nimbus - Open Nebula.

TOTAL (45 + 30) : 75 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability
- Choose the appropriate technologies, algorithms and approaches for the related issues
TEXTBOOKS

REFERENCES

XC7861 SOFTWARE TESTING LABORATORY
L T P C
0 0 4 2

Testing of the following software using software engineering methodology:
Use Rational Suite and other Open source Tools.

1. Perform experiments to do the following:
   a. Unit Testing
   b. System and Integration Testing
   c. Regression Testing
   d. User Acceptance Testing (UAT)
   e. Performance Testing – Front-end and Back-end

2. Mini projects on any relevant current topics. Suggested topics:
   a. Insurance Management Application
   b. Reservation Systems for Air lines, Railways etc.
   c. Knowledge Management System in education
   d. Remote Procedure Call Implementation
   e. Banking Applications

TOTAL: 60 PERIODS
OBJECTIVES

- The objective of the course is to give the student experience in modeling, solving and analyzing problems using linear programming.
- Emphasis will be stressed on theory, applications, and computer usage.

UNIT I LINEAR PROGRAMMING 12
Formulation of linear programming models - Graphical solution - The simplex method – Transportation and Assignment problems.

UNIT II INTEGER PROGRAMMING 12
Introduction – Cutting plane Algorithm – Branch and Bound Algorithm – Zero-one Programming.

UNIT III NON-LINEAR PROGRAMMING 12
Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn-Tucker conditions – Quadratic programming.

UNIT IV GAME THEORY 12
Optimal solution of two person zero-run games – Mixed strategies – Graphical solutions of (2 x n) and (m x 2) games – Solution of (m x n) games by linear Programming.

UNIT V DETERMINISTIC DYNAMIC PROGRAMMING 12

TOTAL: 60 PERIODS

OUTCOMES

Upon completion of the subject, students will be able to:

- By the end of the course the student should have developed the skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling framework;
- develop linear programming models that consider the key elements of the real world problem;
- solve the models for their optimal solutions
- interpret the models' solutions and infer solutions to the real-world problems.

TEXTBOOKS

REFERENCES
OBJECTIVES
- To aware the significance of information in the business scenario
- To familiarize method of restoring, retrieving and presenting the information.

UNIT I

UNIT II
Organizing – Definition-Organizational Structure : Departmentation - Line/Staff Authority and Decentralization - Effective Organizing and Organizational Culture - Motivation - Leadership - Communication - Controlling - Control Techniques and Information Technology.

UNIT III

UNIT IV
Legal issues in IT-IT Act,2000-Computer crimes, securing the web, Software audit. Ethics for IS Professionals - Social challenges.

UNIT V

TOTAL: 45 PERIODS

OUTCOMES
- discuss the process of information systems innovation as a sociotechnical endeavour that comprises both technology and organisational change
- identify the main trends in the socio-economic context of organisations that affect IS innovation
- critically discuss the relationship between ICT and organisational change
- discuss the strategic value of information systems for organisations and methods used for information systems planning
- critically discuss the options organisation have to acquire the technologies they need for their information systems
- critically discuss some of the most frequently used methods for developing and implementing information systems
- describe the tasks involved in managing IS development and implementation projects
- discuss the challenges facing information systems management
- explain the notion enterprise governance of IT
- identify the security risks confronting information systems and the mechanisms used to address them
- critically discuss threats to privacy associated with the use of ICTs in organisations.

REFERENCES
OBJECTIVES

- To introduce the characteristics, basic concepts and systems issues in mobile and pervasive computing
- To illustrate architecture and protocols in pervasive computing and to identify the trends and latest development of the technologies in the area
- To design successful mobile and pervasive computing applications and services research project
- To evaluate critical design tradeoffs associated with different mobile technologies, architectures, interfaces and business models and how they impact the usability, security, privacy and commercial viability of mobile and pervasive computing services and applications

UNIT I INTRODUCTION


UNIT II TELECOMMUNICATION AND SATELLITE SYSTEMS


UNIT III PERVERSIVE COMPUTING


UNIT IV PROTOCOLS


UNITV TECHNOLOGIES, PLATFORMS AND RECENT TRENDS


TOTAL: 45 PERIODS

OUTCOMES

At the end of the course the student should be able to,

- To deploy 3G networks.
- To develop suitable algorithms for 4G networks.
- To use sensor and mesh networks to develop mobile computing environment.
- To develop mobile computing applications based on the paradigm of context aware computing.

TEXTBOOKS

REFERENCES

XT7953 SERVICE ORIENTED ARCHITECTURE L T P C 3 0 0 3

OBJECTIVES
• To provide fundamental concepts of Service Oriented Architecture.
• To gain knowledge about SOAP, UDDI and XML to create web services.
• To know about the Cloud Computing architecture and services.

UNIT I SOFTWARE ARCHITECTURE AND SOA
Types of IT Architecture-SOA (Service Oriented Architecture)-Evolution-key components- Enterprise-wide SOA-Enterprise Applications-Software platforms for Enterprise Applications-contents Service-Oriented Enterprise Applications.

UNIT II SOA DESIGN AND GOVERNANCE
Service Oriented Analysis and Design-Technologies for SOA-Business case for SOA- SOA Implementation and Governance-Trends in SOA.

UNIT III WEB SERVICES

UNIT IV WEB SERVICES IMPLEMENTATION
Java implementation - JAXP-JAX-RPC-JAXM-JAXR-JAXB - .NET framework - Web Service through .NET.

UNIT V ADVANCED TOPICS

OUTCOMES
Upon completion of the subject, students will be able to:
• Known about the basic principles of service oriented architecture , its components and techniques
• Understand the architecture of web services
• Able to design and develop web services using protocol
• Understand technology underlying the service design
• Acquire the fundamental knowledge of cloud computing

TEXTBOOKS
REFERENCES

XT7961 SERVICE ORIENTED ARCHITECTURE LABORATORY

1. XML-RPC and SOAP implementation.
2. Web services using Java.
3. Web services using .NET.
4. Web services using Database Connectivity.
5. Creation of a BPEL module and a composite application.
7. Integration of heterogeneous Web services.
8. Mini Project. (Application of the above experiments)

TOTAL: 60 PERIODS

MA7071 ALGEBRA AND NUMBER THEORY

UNIT I FIELDS
Groups and Cyclic groups - Rings and Polynomials – Fields.

UNIT II FINITE FIELDS AND POLYNOMIALS
Finite Fields – Irreducible Polynomials over Finite fields – Factorization of Polynomials over Finite Fields.

UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS
Division algorithm- Base-b representations – Prime and composite numbers – Prime number theorem - GCD – Euclidean Algorithm – Fundamental theorem of Arithmetic – LCM.

UNIT IV DIOPHANTINE EQUATIONS AND CONGRUENCES
Linear Diophantine equations – Congruence’s – Linear Congruence’s – Modular exponentiation - Applications: Divisibility tests– Chinese remainder theorem – 2x2 linear systems.

UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS
Wilson’s theorem – Fermat’s Little theorem – Euler’s theorem – Euler’s Phi functions – Tau and Sigma functions– Mobius Function.

TOTAL : 45 PERIODS
TEXTBOOKS

REFERENCES

XC7071 COMPUTATION COMPLEXITY L T P C
3 0 0 3

OBJECTIVES
- To address the theoretical and practical limitations of computation.
- To provide a theoretical framework for modelling computation.
- The concepts of undecidability and intractability are introduced through a number of examples.
- The course will convey the proof techniques that are used to classify problems and it is intended that students learn how to apply them in order to classify unfamiliar problems for themselves.

UNIT I TIME AND SPACE BOUNDED COMPUTATIONS AND MODELS OF COMPUTATIONS
Finite Automaton, Turing machines, Non-deterministic Turing Machines, Oracle Turing Machines – Order of magnitude, running time and work space of TMs – Time and Space constructability

UNIT II CENTRAL COMPLEXITY CLASSES
Basic definitions and relationships – Computing functions – Invertibility and honesty – Polynomial time many-one reducibility – Natural Np Complete Sets – Natural PSPACE complete sets.

UNIT III TURING REDUCIBILITY AND NON-UNIFORM COMPLEXITY

UNIT IV UNIFORM DIAGONALIZATIONS
Uniform Deagonalization – Presentability and other properties – Recursive sets and diagonalization – Applications to recursively presentable sets – Delayed diagonalization.

UNIT V POLYNOMIAL TIME HIERARCHY
Polynomial time hierarchy – Characterization – Relations with quantifies – Complete sets and presentability – Alternating TM.

TOTAL: 45 PERIODS

OUTCOMES
Upon successful completion of this course students should be able to:
- Understand basic properties of formal languages and formal grammars
- Understand basic properties of deterministic and nondeterministic finite automata
- Understand the relation between types of languages and types of finite automata
- Understand basic properties of Turing machines and computing with Turing machines
- Understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problems
• Understand the challenges for Theoretical Computer Science and its contribution to other sciences
• analyse the complexity of a variety of problems and algorithms;
• reduce one problem to another; prove that a problem is undecidable;
• find a polynomial time reduction from one problem to another;
• determine the complexity class of a decidable problem;
• categorise the complexity of a language

TEXTBOOK

REFERENCES

XC7072 EMBEDDED SYSTEMS L T P C
3 0 0 3

OBJECTIVES
• To understand the architecture of embedded processor, microcontroller and peripheral devices.
• To interface memory and peripherals with embedded systems.
• To study the embedded network environment.
• To understand challenges in Real time operating systems.
• To study, analyze and design applications on embedded systems.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

UNIT II INTERRUPT SERVICE ROUTINES
Watch dog timers – Flash Memory basic – Host based debugging – Remote debugging – ROM emulators – Logic analyser – Hardware break points - In Circuit Emulators

UNIT III REAL-TIME OPERATING SYSTEMS

UNIT IV BUSES AND PROTOCOLS

UNIT V EMBEDDED SOFTWARE DEVELOPMENT TOOLS
Host and target machines – cross compilers – linker and locators for embedded software – address resolution – locating program components – initialized data and constant strings – PROM programmers – ROM emulators – Flash memory.

TOTAL: 45 PERIODS
OUTCOMES
Upon completion of the course, the students will be able to

• Understand different architectures of embedded processor, microcontroller and peripheral devices.
• Interface memory and peripherals with embedded systems.
• Familiar with embedded network environment.
• Understand challenges in Real time operating systems.
• Design and analyze applications on embedded systems.

TEXTBOOKS

REFERENCES

XC7073         FAULT TOLERANT SYSTEMS       L T P C
3 0 0 3

OBJECTIVES

• To define common terms such as availability, reliability, dependability etc.
• To List common threats to dependability and their mitigation methods
• To Solve reliability block diagrams involving series, parallel and networks of components. Apply the laws of discrete probability to evaluating systems.
• To Evaluate simple redundancy schemes through the laws of continuous probability, provided the failures are exponentially distributed.
• To Apply fault-tolerance techniques such as error correcting circuits and duplicate execution to the design of hardware systems.
• To Model systems using Markov models and Stochastic Activity Networks (SAN)
• To Evaluate the reliability of systems through fault-injections and simulations

UNIT I         FUNDAMENTALS OF RELIABILITY

UNIT II         FAULT TOLERANT DESIGN
Hardware Redundancy – Information Redundancy – Time Redundancy - Software Redundancy – System Level Fault Tolerance

UNIT III         NETWORK FAULT TOLERANCE

UNIT IV         SOFTWARE RELIABILITY MODELING
General Model Characteristics – Model Classification scheme – Markovian models – General concepts – Poisson-Type Models – Binomial Type Models – Fault reduction factor for Poisson Type models.
UNIT V  COMPARISON OF SOFTWARE RELIABILITY MODELS  

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students would have learnt to:

Define the traditional measures of fault tolerance
• Discuss the various hardware fault tolerance techniques used
• Point out the processor level fault tolerance techniques
• Discuss error detecting and correcting codes
• Critically analyze the different types of RAID levels
• Discuss the different network topologies and their resilience
• Discuss techniques like recovery blocks and N-version programming
• Define check pointing and models for optimal check pointing
• Identify techniques for check pointing in distributed and shared memory systems
• Distinguish between symmetric key ciphers and public key ciphers
• Provide techniques to detect injected faults in ciphers

TEXTBOOKS

REFERENCES

XC7074  HIGH SPEED NETWORKS  L T P C  3 0 0 3

OBJECTIVES
• To facilitate the students on the basis of ATM and Frame relay concepts and explain the various types of LAN’s and to know about their applications.
• To provide an overview of high-speed networking technologies.
• To learn the enhanced set of functionalities for high-speed networking.
• To understand the underlying concept involved for high performance
• To Enable the students to know techniques involved to support real-time traffic and congestion control

UNIT I  HIGH SPEED NETWORKS
UNIT II  CONGESTION AND TRAFFIC MANAGEMENT  8

UNIT III  TCP AND ATM CONGESTION CONTROL  12

UNIT IV  INTEGRATED AND DIFFERENTIATED SERVICES  8

UNIT V  MPLS NETWORKS  8

OUTCOMES
Upon completion of the subject, students would be able to :
- Understand the building blocks and operation of high speed networking technology including the hardware and software components.

TEXTBOOKS

REFERENCES
UNIT III INTERNATIONAL TREATIES ON IPR

UNIT IV INDIAN IPR LEGISLATIONS

UNIT V IPR IN ELECTRONICS AND INFORMATION TECHNOLOGY
IPR in Electronics & Information Technology -Case Studies on – Patents pertaining to Electronics & Information Technology – Software patents International scenario – Patent & Copyright Protection for software& Electronic inventions - IPR in Electronics and Information Technology.

TOTAL: 45 PERIODS

TEXTBOOKS

REFERENCES

OBJECTIVES:
- To know about Supervised and unsupervised Learning.
- To study about feature extraction and structural pattern recognition.
- To explore different classification models.
- To understand Fuzzy Pattern Classifiers and Perception.

UNIT I OVERVIEW OF PATTERN RECOGNITION
Discriminant functions - Supervised learning - Parametric estimation - Maximum Likelihood estimation - Bayesian parameter estimation - Problems with Bayes Approach - Pattern classification by distance functions - minimum distance Pattern classifier.

UNIT II UNSUPERVISED CLASSIFICATION
Clustering for unsupervised learning and classification, clustering concepts C – means algorithm – hierarchical clustering – Graph theoretic approach to pattern clustering - Validity of clustering solutions.
UNIT III  FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION

UNIT IV  AI TECHNIQUES

UNIT V  RECENT ADVANCES AND IMAGE APPLICATIONS
Learning of neural pattern recognition - Fuzzy logic – Fuzzy pattern classifiers – image segmentation – Credit scoring – Applications in Computer vision, Automated Target recognition, Finger print Identification, Industrial Inspection.

OUTCOMES
Upon completion of the subject, students would have learnt about:
- Classification of data and identifying patterns.
- How to Extract feature set and select the features from given data set

TEXTBOOK

REFERENCES

XC7077 VISUAL PROGRAMMING

OBJECTIVES
- To introduce the concepts of visual programming
- To introduce GUI programming using Microsoft foundation classes.
- To enable the students to develop programs and simple application using Visual C++.

UNIT I  VB.NET FUNDAMENTALS
Introduction to .NET Framework - Controls – Menus and Dialog Boxes – Variables and Operators – Decision Structures –Loops and Timers - Debugging -Trapping and Handling Errors
UNIT II  VB.NET PROGRAMMING  

UNIT III  VB.NET UI DESIGN AND DATABASE APPLICATIONS  

UNIT IV  VC++ FUNDAMENTALS  

UNIT V  VC++ UI DESIGN AND DATABASE APPLICATIONS  

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of this course, the student will be able to:

• Design, create, build, and debug VB.net and VC++ applications.
• Explore VB.net and VC++ s Integrated Development Environment (IDE).
• Implement syntax rules in VB.net and VC++.
• Explain variables and data types used in program development.
• Apply arithmetic operations for displaying numeric output.
• Write and apply decision structures for determining different operations.
• Write and apply loop structures to perform repetitive tasks.
• Write and apply procedures, sub-procedures, and functions to create manageable code.
• Create one and two dimensional arrays for sorting, calculating, and displaying of data.
• Write VB.net and VC++ programs using object-oriented programming techniques including classes, objects, methods, instance variables, composition, and inheritance, and polymorphism.
• Write Windows applications using forms, controls, and events.

TEXTBOOKS
   (Units 1, 2, 3 – Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20)
   (Units 4, 5 – Chapters 1, 2, 3, 4, 5, 6, 7, 8, 17, 18, 20, 31)

REFERENCES
3. MSDN Library
OBJECTIVES
• To gain knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
• To gain knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
• To gain knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
• To gain knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

UNIT I  INTRODUCTION TO MANET AND ROUTING

UNIT II  ADHOC MAC LAYERS
MAC LAYER – IEEE 802.11 (for wireless LANs) – IEEE 802.15 – Bluetooth technology – Wireless Mesh Networks.

UNIT III  ADHOC TRANSPORT LAYERS

UNIT IV  SENSOR NETWORKS

UNIT V  ENERGY MANAGEMENT AND SECURITY

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to:
• understand the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
• have an understanding of the principles and characteristics of wireless sensor networks (WSNs).
• understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
• understand how reactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
• understand how hybrid routing protocols function and their ability to balance speed and bandwidth consumption.

TEXTBOOKS
REFERENCES

XT7072 BIO INFORMATICS  L T P C  3 0 0 3

OBJECTIVES
- To impart knowledge on basic techniques of Bioinformatics.
  working knowledge of biology and its applications
- To increase proficiency in computer languages
- To gain skills in data mining
- To gain skills in data visualization
- experience with systems biology tools

UNIT I INTRODUCTION
Over view and need for Bioinformatics technologies – Role of Structural bioinformatics – Data format and processing – Secondary resources and applications - Biological Data Integration System.

UNIT II DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS

UNIT III MODELING FOR BIOINFORMATICS

UNIT IV PATTERN MATCHING AND VISUALIZATION

UNIT V MICROARRAY ANALYSIS

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students would have learnt about:
- Sequencing Alignment and Dynamic Programming, Sequence Databases, Evolutionary Trees and Phylogeny
- Prepare large-scale expression and sequence data for bioinformatics analyses
- Write programs to manipulate files and directories
- Extract useful information from text files
- Learn genomics resource and how to annotate genes
TEXTBOOKS

REFERENCES

XT7073 DIGITAL IMAGE PROCESSING

OBJECTIVES
- Learn the fundamental concepts and applications of digital image processing.
- Learn the concepts of and how to perform Intensity transformations and spatial filtering.
- Understand the relationship between Filtering in the spatial and frequency domains.
- Understand the concepts of and how to perform Image restoration and reconstruction, Color image processing, Wavelets and multiresolution processing, Image compression and watermarking, Morphological image processing, Image segmentation, Representation and description.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING

UNIT II IMAGE ENHANCEMENT

UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS

UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSIONS

UNIT V APPLICATIONS OF IMAGE PROCESSING

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students would have learnt about:
- apply knowledge of mathematics, science, and engineering.
- design and conduct experiments, as well as to analyze and interpret data.
- identify, formulate, and solve engineering problems.
- use the techniques, skills, and modern engineering tools necessary for computer engineering practice.
REFERENCES

OBJECTIVES
- To introduce the basic concepts and techniques for processing signals on a computer.
- To familiarize with the most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.
- To emphasize intuitive understanding and practical implementations of the theoretical concepts.

UNIT I - SIGNALS SYSTEMS

UNIT II - FAST FOURIER TRANSFORMS

UNIT III - IIR FILTER DESIGN

UNIT IV - FIR FILTER DESIGN

UNIT V - FINITE WORD LENGTH EFFECTS

OUTCOMES
Upon completion of the subject, students would have learnt about:
- How to represent discrete-time signals analytically and visualize them in the time domain. The meaning and implications of the properties of systems and signals.
- The Transform domain and its significance and problems related to computational complexity.
- How to specify and design any digital filters using MATLAB.
TEXTBOOK

REFERENCES

XT7075 ELECTRONIC COMMERCE

OBJECTIVES
To introduce the concept of electronic commerce,
To understand how electronic commerce is affecting business enterprises, governments, consumers and people in general.
To study the development of websites using relevant software tools.
- Acquaint students with a fundamental understanding of the environment and strategies in the New Economy.
- Provide analytical tools to understand opportunities in unserved or underserved New Economy markets.
- Provide a fundamental understanding of the different types and key components on business models in the New Economy.
- Provide guiding principles behind the design and strategy of the customer web interface.
- Understand the traditional and new communication/marketing approaches that create competitive advantage in the New Economy.
- Provide insights on how to implement strategy in the New Economy.
- Understand the metrics that New Economy firms to use to measure progress, customer satisfaction, and financial performance.
- Understand the fundamentals of financially valuing New Economy companies.
- Provide an overview of the hardware, software, servers, and the parts that make up the enabling "railroad" for the New Economy.

UNIT I INTRODUCTION TO ELECTRONIC COMMERCE
Electronic commerce framework- Electronic commerce and media convergence- Anatomy of Electronic commerce application – consumer and organization application – components of the i-way – Network access equipment – Global information networks – Public policy issues shaping the i-way.

UNIT II INFRASTRUCTURE FOR ELECTRONIC COMMERCE

UNIT III WEB BASED ELECTRONIC COMMERCE
UNIT IV  ELECTRONIC COMMERCE RESOURCES  9

UNIT V  CURRENT TRENDS  9
Multimedia and digital video – Broad band telecommunication – Mobile and wireless computing framework – Mobile computing application – Personal communication services – current topics and issues.

OUTCOMES
Upon completion of the subject, students is expected to:
- to realise the problems involved in designing and building e-commerce systems;
- understand the need to design EC systems that fully meet the requirements of the intended users;
- appreciate the need to ensure that the implementation of a design is adequately tested to ensure that the completed EC system meets the specifications;
- be fully aware of the principles and practice of an O-O approach to the design and development of EC systems; be able to apply these principles in practice.

1. Explain the components and roles of the Electronic Commerce environment.
2. Explain how businesses sell products and services on the Web.
3. Describe the qualities of an effective Web business presence.
4. Describe E-Commerce payment systems.
5. Explain how to meet the needs of Web site visitors.
6. Identify and reach customers on the Web.
7. Understand Web marketing approaches and elements of branding.
8. Explain the client/server infrastructure that supports electronic commerce.
9. Explain basic electronic commerce functions.
10. Understand legal and ethical issues related to E-Commerce.

TEXTBOOK

REFERENCES

XT7076  FREE AND OPEN SOURCE SOFTWARE  L T P C  3003

OBJECTIVES
- To expose to the context and operation of free and open source software (FOSS) communities and associated software projects.
- To familiarize with participating in a FOSS project
- To Learn scripting language like Python
- To 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 – user friendliness perspective – scientific perspective.

UNIT II systEm Administration 10

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

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.

TOTAL: 45 PERIODS

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.

TEXTBOOK

REFERENCES
1. Philosophy of GNU URL: http://www.gnu.org/philosophy/
2. Overview of Linux Distributions URL:
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:
OBJECTIVES
• To get subsequent understanding of game design and development, which includes the processes, mechanics, issues in game design, game engine development, modeling techniques, handling situations, and logic. At the end, the student will be in a position to create interactive games. To learn this course an exposure to 3D graphics principles and animation techniques are the prerequisite.

UNIT I          GRAPHICS FOR GAME PROGRAMMING

UNIT II          GAME DESIGN PRINCIPLES
Game Logic, Game AI, Path Finding, Game Theory, Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection.

UNIT III        GAMING ENGINE DESIGN
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
Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity.

UNIT V        GAME DEVELOPMENT
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
Upon successful completion of this subject students should be able to:
• Illustrate an understanding of the concepts behind game programming techniques.
• Implement game programming techniques to solve game development tasks.
• Construct a basic game engine using open-source programming libraries.
TEXTBOOKS

REFERENCES
6. Andy Harris, “Beginning Flash Game Programming For Dummies”, For Dummies; Updated edition, 2005.

GEOGRAPHIC INFORMATION SYSTEM

OBJECTIVES
- To Develop an understanding of the world’s quickly-growing spatial data infrastructure and of how to put it to work for producing location-based information.
- To identify the relevant spatial characteristics of diverse application areas enabling professionals to integrate spatial thinking and GIS analysis into their careers.
- To have an ability to use geospatial technologies to gain a significant advantage in the information technology field.

UNIT I
GIS – Definition -History of GIS -Basic Components of GIS – Hardware, Software, Data, Methods, People – List of GIS Software: Popular software, Open Source software

UNIT II
UNIT III

UNIT IV

UNIT V

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students would have learnt about:

- How to describe what GIS is; name the major GIS software available; know where to find more information
- How to explain the components and functionality of a GIS and the differences between GIS and other information systems
- The nature of geographic information and explain how it is stored in computer (including map projection) and the two types of GIS data structure
- How to conduct simple spatial analysis using GIS software
- How to design and complete a GIS project from start to finish (data capture, data storage and management, analysis, and presentation)

TEXTBOOK

REFERENCES

XT7079 INFORMATION CODING TECHNIQUES

OBJECTIVES
To introduce information theory leading to the channel capacity theorem.
To introduce the fundamentals of error control coding techniques
UNIT I INFORMATION ENTROPY FUNDAMENTALS

UNIT II DATA AND VOICE CODING

UNIT III ERROR CONTROL CODING
Linear block codes – Syndrome decoding – Minimum distance consideration – Cyclic codes – Generator polynomial – Parity check polynomial – Encoder for cyclic codes – Calculation of syndrome – Convolutional codes.

UNIT IV COMPRESSION TECHNIQUES

UNIT V AUDIO AND VIDEO CODING

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students would have learnt about:
- The basic notions of information and channel capacity.
- Convolutional and block codes, decoding techniques, and automatic repeat request (ARQ) schemes.
- How error control coding techniques are applied in communication systems.

TEXTBOOKS

REFERENCES
UNIT II SECURITY INVESTIGATION

UNIT III SECURITY ANALYSIS

UNIT IV LOGICAL DESIGN

UNIT V PHYSICAL DESIGN

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of the subject, students would have learnt about:
- How to identify both external and internal vulnerabilities to enterprise computer infrastructures and sensitive digital assets and devise a mitigation plan against them.
- Have comprehensive information about security policies, establishing necessary organizational processes/functions for information security and will be able to arrange necessary resources.
- Differentiating among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
- About cyber law and ethics.

REFERENCES

XT7081 MODELING AND SIMULATION

OBJECTIVES
- To introduce students to basic simulation methods and tools for modelling and simulation of continuous, discrete and combined systems.

UNIT I INTRODUCTION

UNIT II RANDOM NUMBERS AND RANDOM-VARIATE GENERATION
UNIT III  QUEUEING MODELS
Characteristics of queueing systems – Long-run measures of performance of queueing systems – Little’s Formula – Steady-state behavior of Finite and Infinite population Markovian queueing models
Networks of Queues

UNIT IV  ANALYSIS OF SIMULATION DATA
Data collection – Identifying the distribution with data – Parameter estimation – Goodness of fit tests – Fitting a non-stationary Poisson process – Selecting input models without data – Multi-variate and Time series input models

UNIT V  SIMULATION OF NETWORKED COMPUTER SYSTEMS
Simulation tools – Model Input – Mobility models in wireless systems – The OSI stack model – Physical layer in wireless systems – Media Access control – Data link layer – TCP – Model construction

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the subject, students will be able to
- understand the system concept and apply functional modeling method to model the activities of a static system;
- understand the behavior of a dynamic system and create an analogous model for a dynamic system
- simulate the operation of a dynamic system and make improvement according to the simulation results.

REFERENCES
UNIT II  QUEUEING NETWORKS  9

UNIT III  QUEUES IN COMPUTER SYSTEMS  9

UNIT IV  DISCRETE TIME QUEUEING MODELS  9

UNIT V  NETWORK PERFORMANCE  9

TOTAL: 45 PERIODS

OUTCOMES
Upon completion of the course, the students will be able to:
• Identify the need for performance evaluation and the metrics used for it
• Discuss open and closed queueing networks
• Define Little’s law and other operational laws
• Apply the operational laws to open and closed systems
• Use discrete-time and continuous-time Markov chains to model real world systems
• Develop analytical techniques for evaluating scheduling policies

TEXTBOOKS

REFERENCES

XT7083  PERSONAL SOFTWARE PROCESSES
L T P C  3 0 0 3

OBJECTIVES
• To study how to manage and track the time for software processes
• To study how to plan a product and how to measure size of a product
• To learn how to schedule a process
• To learn about software Development process
• To learn how to estimate the product and process quality.

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UNIT I  OVERVIEW AND PLANNING PROCESS

UNIT II  SOFTWARE SIZE, PROBE SIZE ESTIMATION AND SCHEDULE ESTIMATION

UNIT III  DESIGN AND CODE METHODOLOGIES AND REVIEWS

UNIT IV  SOFTWARE QUALITY MANAGEMENT AND PROCESS DESCRIPTION

UNIT V  DATA SUMMARY AND CAUSAL ANALYSIS AND DEVELOPING PSP PROCESS SCRIPTS

OUTCOMES
The students will be able to Upon Completion of the course,
- Explain software development life cycle
- Adopt a suitable process for software development
- Elicit functional and quality requirements
- Analyze, prioritize, and manage requirements
- Perform trade-off among conflicting requirements
- Identify and prioritize risks and create mitigation plans
- Estimate the efforts required for software development
- Perform planning and tracking activities
- Control the artifacts during software development
- Perform various tests to ensure quality
- Define new processes based on the needs
- Adopt best practices for process improvement

TEXTBOOK

REFERENCES
OBJECTIVES

- To learn the key aspects of Soft computing and Neural networks.
- To study the fuzzy logic components.
- To gain insight onto Neuro Fuzzy modeling and control.
- To know about the components and building block hypothesis of Genetic algorithm
- To gain knowledge in machine learning through Support Vector Machines.

UNIT I         INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS


UNIT II          FUZZY SETS AND FUZZY LOGIC


UNIT III        GENETIC ALGORITHMS

Introduction - Traditional vs. Genetic algorithm - Basic genetic operation - Schema Theorem Classification of genetic algorithm - Holland Classifier Systems - Genetic programming, gene encoding, fitness function and reproduction, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (Travelling Salesman Problem), Applications of GA.

UNIT IV        NEURO-FUZZY MODELING


UNIT V        APPLICATIONS OF SOFT COMPUTING

ANFIS Applications - Printed Character Recognition - Nonlinear system identification - Channel Equalization - Fuzzy Filtered Neural Networks - Hand written Numeral Recognition - Soft computing for color recipe Prediction - CANFIS modeling

TOTAL: 45 PERIODS

OUTCOMES

- Upon Completion of the course, the students should be able to
- To discuss on machine learning through Neural networks.
- Apply knowledge in developing a Fuzzy expert system.
- Able to model Neuro Fuzzy system for clustering and classification.
- Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.

TEXTBOOKS

REFERENCES

XT7085 SOFTWARE METRICS

OBJECTIVES
- To acquire methods to evaluate software artifacts with a rigorous and modern approach.
- To learn how to manage software development projects to produce high quality software.
- To gain experience of how, where and when improving real software products and processes with the application of basic mathematical concepts.

UNIT I MEASUREMENT IN SOFTWARE ENGINEERING
Scope of software metrics- key stages of formal measurement- McCabe’s cyclomatic computing – Direct and Indirect measurement – Measurement for prediction - Measurement scales and scale types-Meaning fullness in Measurement –statistical operations on measures-objective and subjective measures- measurement in extended number systems

UNIT II GOAL BASED FRAMEWORK AND EMPIRICAL EVALUATION
Classifying software measures – determining what to measure-applying the framework-software measure validation- software measurement validation in practice-four principles of empirical investigation-planning formal experiments- planning case studies.

UNIT III DATA COLLECTION AND ANALYZING DATA
Good data- define data- how to collect data- how to store and extract data – analyzing results of experiments- examples of simple analysis technique-more advanced methods-overview of statistical tests

UNIT IV INTERNAL PRODUCT ATTRIBUTES

UNIT V EXTERNAL PRODUCT ATTRIBUTES AND EMPIRICAL RESEARCH IN SOFTWARE ENGINEERING
Modeling software quality- measuring aspects of quality – problems with empirical research- investigating products – investigating resources- investigating processes- measurement present and future.

TOTAL : 45 PERIODS
OUTCOMES
Upon completion of the subject, students would have learnt about:

- the objectives and general principles of measurement
- assess different software products with a critical decision process based on a rigorous mathematical and deductive approach.

TEXTBOOKS

OUTCOMES
Upon successful completion of the module students will be able to:

- Develop an understanding on quality management philosophies and frameworks
- Develop in-depth knowledge on various tools and techniques of quality management
- Learn the applications of quality tools and techniques in both manufacturing and service industry.
• Develop analytical skills for investigating and analysing quality management issues in the industry and suggest implementable solutions to those.
• Assess exactly where an organization stands on quality management with respect to the ISO 9000 quality management standard and the Baldrige Award criteria.
• Successfully implement process improvement teams trained to use the various quality tools for identifying appropriate process improvements.

**TEXTBOOK**

**REFERENCES**

**XT7087 WAVELET ANALYSIS**

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**UNIT I SIGNALS AND SYSTEMS**

**UNIT II HAAR SYSTEM**
Dyadic Step Functions-The Haar System-Splitting Lemma-Haar Bases on $[0,1]$-Comparison of Haar System with Fourier Series- Haar Bases on $R$-Discrete Har Transform-Image analysis with Haar Transform.

**UNIT III MULTI RESOLUTION ANALYSIS**

**UNIT IV DISCRETE WAVELET TRANSFORM**
From MRA to Discrete Transform-The Quadrature Mirror Filter Conditions-DWT for finite signals-Scaling functions from scaling sequences-The Cascade Algorithm-Support of Scaling Functions.

**UNIT V COMPactly SUPPORTED WAVELETS AND APPLICATIONS**
Vanishing Moments-Daubechies Wavelets-Image Analysis with smooth Wavelets.

**TOTAL: 45 PERIODS**

**TEXT BOOKS**

**REFERENCES**
OBJECTIVES

- To develop an awareness of the need for project planning and management
- To apply professional attitudes and techniques to managing a project
- To explain the stages in the system development lifecycle and the activities that are carried out to implement an IT application;
- To demonstrate an understanding of steps needed to build and maintain effective development teams
- To explain the procedures needed to monitor, control and report upon an IT development project
- To discuss and where appropriate apply the principles of project risk management.
- To explain the ways in which appropriate quality attributes of the products of an IT development project can be assessed and assured.

UNIT I FUNDAMENTALS

Conventional software management - Evolution of software economics - Improving software economics - Conventional Vs Modern software project management.

UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK

Lifecycle phases - Artifacts of the process - Model based software architectures - Workflows of the process - Checkpoints of the process.

UNIT III SOFTWARE MANAGEMENT DISCIPLINES

Iterative process planning - Organization and Responsibilities - Process automation - Process control and process instrumentation - Tailoring the process. Project planning - Scheduling - Tracking and Control - Time and Cost overruns - Project organization - Staffing - Group working - Team dynamics.

UNIT IV MANAGED AND OPTIMIZED PROCESSES

Quality management and ISO 9000 quality assurance method - Configuration management - Quality reviews - Software standards - Tracking of defects - Process improvements - SCI/CMM models - Other process models - Data gathering and analysis - Principles of data gathering - Data gathering process - Software measures - Data analysis - Managing software quality - Defect prevention.

UNIT V CASE STUDIES

COCOMO Cost estimation model - Change metrics - Case studies.

TOTAL: 45 PERIODS

OUTCOMES

Upon completion of the subject, students will be able to:

- match organizational needs to the most effective software development model
- effectively plan the software projects
- implement the project plans through managing people, communications and change
- select and employ mechanisms for tracking the software projects
- to conduct activities necessary to successfully complete and close the software projects
- to develop the skills for tracking and controlling software deliverables
- to create project plans that address real-world management challenges

TEXT BOOKS


REFERENCES