DEPARTMENT OF MATHEMATICS
ANNA UNIVERSITY, CHENNAI

VISION
We, at the Department of Mathematics, Anna University, Chennai, shall strive constantly to

- Achieve excellence in Mathematics education by providing high quality teaching, research and training in Mathematics to all our students to significantly contribute in the fields of Mathematics, Computer Science and all related Engineering fields.

- Contribute to the quality Human Resource Development in Mathematics and Computer Science through our effective Masters and Research Programmes.

MISSION

- To provide strong Mathematical background to Engineering Students to cope up with the needs of emerging technologies both at National and International levels.

- To popularize and to project the proper perspective of Mathematics and Computer Science towards attracting young talents to take up teaching and research careers in Mathematical Sciences.
1. **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**

1. To make the students to be knowledgeable and competitive in the field of Computer Science to take up career or higher studies.
2. To ensure the students have good understanding in the fundamental and core concepts of computer science that would give strong theoretical foundation.
3. To ensure the students are aware of the cutting edge technologies currently being used in industries and provide them a platform to learn the same.
4. To ensure the students work on multiple academic projects pertaining to different domains, to have strong knowledge in the respective domain.
5. To ensure this academic programme provides them learning to take leadership positions in the industry and also initiate businesses offering innovative solutions and ability to identify, formulate and solve diverse industrial problems/software design and development process.

2. **PROGRAMME OUTCOMES (POs):**

After going through the five years of study, our Computer Science Post-Graduates will exhibit ability to:

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<th>PO#</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
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<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
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<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
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<td>3</td>
<td>Design/development of solutions</td>
<td>Design a system or process to improve its performance, satisfying its constraints.</td>
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<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>Conduct experiments &amp;collect, analyze and interpret the data.</td>
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<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<td>7</td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<td>8</td>
<td>Ethics</td>
<td>Interaction with industry, business and society in a professional and ethical manner.</td>
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<td>9</td>
<td>Individual and team work</td>
<td>Function in a multi-disciplinary team.</td>
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<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
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<td>11</td>
<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
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<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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3. **PROGRAM SPECIFIC OUTCOMES (PSOs):**

By the completion of the Integrated M.Sc. (Computer Science) program the student will have following program specific outcomes.

1. The ability to solve algorithmically and implementing them with efficient code.
2. The ability to have in depth knowledge in the fundamentals of Computer Science, to solve and implement new practices in Research and Development.
3. The ability to learn new technologies or apply new knowledge as needed, using appropriate learning strategies.
4. The ability to work productively as computer professionals by: demonstrating with effective communication, technical skills and adhering the high ethical standards in the profession.

4. **PEO / PO Mapping:**

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<th>PROGRAMME OUTCOMES</th>
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ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.Sc. COMPUTER SCIENCE (FIVE YEARS INTEGRATED)
REGULATION 2019
CHOICE-BASED CREDIT SYSTEM
CURRICULA AND SYLLABI

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*Audit Course is Optional*

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<th>COURSE CODE</th>
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<td>1.</td>
<td>XT5088</td>
<td>3G &amp; 4G Wireless Networks</td>
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### ELECTIVE VI

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### OPEN ELECTIVES COURSES (OEC)

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### AUDIT COURSES (AC)

Registration for any of these courses is optional to students

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Total Credits: 0
### SUMMARY

#### M.Sc. COMPUTER SCIENCE (FIVE YEARS INTEGRATED)

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<td>Total Credit</td>
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15

**Attested**

**DIRECTOR**

Centre for Academic Courses
Anna University, Chennai-600 025
OBJECTIVES:
- To give more practice in using the four basic language skills – reading, writing, listening and speaking
- To learn to communicate in both oral and written form in a formal context
- To interpret graphical information and make inferences
- To critically evaluate online content and comprehend the message

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V

TOTAL: 45 PERIODS

OUTCOMES
By the end of the course students would have
- Gained more practice in using four language skills – listening, speaking, reading and writing
- Learnt to communicate in both oral and written form in formal and informal context
- Known how to interpret graphical images and infer the message in them
- Learnt how to critically evaluate online content and understand the message

REFERENCES:
OBJECTIVES:

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals. Students will use these tools to solve application problems in a variety of settings ranging from physics and biology to business and economics.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I  LIMITS AND CONTINUITYOF FUNCTIONS  12

UNIT II  DIFFERENTIALCALCULUS  12
Derivatives of a function - Derivative of polynomial and exponential functions - Differentiation rules - Derivative of trigonometric functions - Functions fail to be differentiable - Relationship between continuity and differentiability - Chain rule - Implicit differentiation - Derivative of logarithmic functions - logarithmic differentiation - Derivative of hyperbolic functions - Maxima and minima - Mean value theorem - L'Hospital Rule - Polar coordinate system - Differentiation in polar coordinates.

UNIT III  SEVERALVARIABLECALCULUS  12

UNIT IV  INTEGRALCALCULUS  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 V  MULTIPLEINTEGRALS  12
Double integrals - Change of order of integration - Double integrals in polar coordinates - Area enclosed by plane curves - Triple integrals - Volume of solids - Change of variables in double and triple integrals.

OUTCOMES:

Upon Completion of the course, the students will be able to:

- As simulate idea so flimits and continuity and an ability to calculate with the mandapply them.
- Improved facility in algebraic manipulation.
- Fluency in differentiation.
- Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
- Familiarizetheideasofdifferentialequationsandfacilityinsolvingsimplestandard examples.

TOTAL: 60 PERIODS
REFERENCES:

PH5152 APPLIED PHYSICS

OBJECTIVES:
- To introduce and teach the concepts of properties of matter and thermal physics
- To make the students to understand the aspects of acoustics and ultrasonics
- To equip the students on the aspects of quantum principles
- The basic aspects of semiconductor physics and devices are introduced
- The students will be introduced the concepts of photonics and fiber-optics principles

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 –Schrödingerwave 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 FIBREOPTICS  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.

OUTCOMES:
After completing this course, the students should be able to
• Understand the concepts of properties of matter and thermal physics
• Apply the concepts of acoustics and ultrasonics
• Appreciate the importance of quantum physics
• Make use of photonic and fibre-optic devices.

REFERENCES:

XC5151  DIGITAL SYSTEMS  L T P C
3 0 2 4

OBJECTIVES:
• To introduce the basic concept of digital and binary systems
• To give fundamentals of Boolean algebra and logic gates
• 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  9

UNIT II  BOOLEAN ALGEBRA AND LOGIC GATES  9
UNIT III GATE - LEVEL MINIMIZATION

UNIT IV COMBINATIONAL LOGIC

UNIT V SEQUENTIAL LOGIC

TOTAL: (45+30) 75 PERIODS

OUTCOMES:
Upon successful completion of this course, students will be able to:
- Apply knowledge of math, science and engineering
- Describe design constraints of digital systems.
- Design digital circuitry, analyze and interpret data
- Combinational logic design implementation.
- Sequential logic design implementation and Design for testability

REFERENCES:

XC5152 PROBLEM SOLVING AND C PROGRAMMING

OBJECTIVES:
- To learn fundamentals of computers and its components
- To learn the process of analyzing a problem and find solutions
- To learn about the role of algorithms and flowcharts in problem analysis and solution
- To know about fundamentals of structured programming language
- To provide complete knowledge of C language.

UNIT I INTRODUCTION TO COMPUTERS AND PROBLEM SOLVING

UNIT II FUNDAMENTALS OF C PROGRAMMING
UNIT III  CONTROL STATEMENTS AND FUNCTIONS

UNIT IV  ARRAYS AND POINTERS
Defining Array – Processing array - Passing array to a function - Multi dimensional array - Pointer declarations- passing pointers to a function - pointers and arrays - operations on pointers - arrays of pointers – passing functions to other functions.

UNIT V  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 – File handling

TOTAL: 45 PERIODS

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

- Use flowcharts and pseudo code to represent program modules
- Formulate algorithm for simple problems
- Analyze different data types and arrays
- Able to develop logics, which will help them to create programs in C.
- Write C program for simple applications

REFERENCES:

HS5161  COMMUNICATION SKILLS LABORATORY

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.

XC5161
C PROGRAMMING LABORATORY

1. Input / Output Statements
2. Control functions
3. Functions with Recursions
4. Arrays
5. Pointers
6. Structures and Unions
7. File Handling

TOTAL: 60 PERIODS

HS5252
TECHNICAL COMMUNICATION

OBJECTIVES:
- To develop the essential English language skills needed to present technical information in oral and written form.
- To introduce different types of technical information sensitize learners on the nuances of Technical English
- To equip learners with required skills in English thereby making them employable.

UNIT I
Listening: listening to product descriptions and labeling parts of a machine Speaking: Giving short talk-participating in conversations-Reading: Reading technical texts and completing skimming, scanning and predicting exercises-Writing: Description of a mechanism at rest and in motion- description of a process Grammar & Vocabulary- use of sequence words, use of connectors-speech acts-simple present, present continuous and present perfect forms

UNIT II
Listening: listening to a technical presentation and taking notes- Speaking: making short technical presentations-Reading: Reading Technical passages and making notes-Writing: recommendations- Introduction to formal email/letter writing- Grammar and Vocabulary-Future forms of verbs, modal verbs, adjectival and adverbial forms of words- prefixes and suffixes
UNIT IV
Listening: Viewing group discussions and completing exercises on the conventions of participating in GDs-
Speaking: Participating in Group Discussions-
Reading: Reading Technical Reports – Writing: Job Applications and drawing up the job resume-
summar y writing - writing a vision statement-
Grammar and Vocabulary - active and passive voice - direct and indirect speech - comparative forms of
adjectives - if clauses

UNIT V
Listening to presentations of technical reports - Speaking: Presenting reports orally - Reading comprehension-
Technical Reports in Newspapers (Technical Journalism) – Writing – a short report on an accident/survey-
Grammar and Vocabulary - Reporting verbs - phrasal verbs - collocations - emotive vs. referenced use of words.

OUTCOMES:
- Gained the essential English language skills needed for presenting technical information in oral and written form.
- Obtained different types of technical information sensitize learners on the nuances of Technical English.
- Equipped the learners with required skills in English thereby making them employable.

REFERENCES:

MA5251 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

OBJECTIVES:
- To introduce the effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes.
- To introduce Laplace transform techniques which will solve initial and boundary value problems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic.

UNIT I DIFFERENTIAL EQUATIONS
Ordinary differential equations: Second order equation - Complementary solution - Particular integral:
Operator Method – Homogenous equation of Euler’s and Legendre’s type; Partial differential equations:

UNIT II FOURIER SERIES
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.
UNIT III  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION  12
Method of separation of Variables – Solutions of one dimensional wave equation and one dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV  LAPLACE TRANSFORMS  12
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear ordinary differential equations with constant coefficients

UNIT V  FOURIER TRANSFORM  12

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
• Understanding the ideas of ordinary differential equations and techniques in solving standard examples;
• The students can able to solve the partial differential equations and solution techniques;
• Understanding the Fourier series analysis and solve the problems by using Fourier series;
• To acquaint the student with Fourier series techniques used in solving boundary value problems;
• The understanding of the mathematical principles on Laplace transforms and solution to differential equations using this technique;
• To acquaint the student with Fourier transform techniques used in wide variety of situation apart from its use in solving boundary value problems.

REFERENCES:

CY5253  CHEMISTRY OF MATERIALS  L T P C  4 0 0 4

OBJECTIVES:
• To introduce the basic concepts of polymer and its application in the field of electronics
• To impart knowledge on composites and its electrical and electronics applications
• To familiarize the student on dielectric, insulators, semi-conductors, magnetic and nono materials
• To teach about the fabrications of integrated circuits and printed circuit boards
• To inculcate sound understanding about batteries and their applications
UNIT I POLYMER IN ELECTRONICS

UNIT II COMPOSITES

UNIT III SPECIALITY MATERIALS

UNIT IV FABRICATION OF INTEGRATED CIRCUITS
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
Primary and Secondary – Requirements – Commercial batteries – Dry Cell, acid cells, alkaline batteries (Ni-Cd), Li-ion. Fuels cells – (Hydrogen - oxygen) – UPS.

TOTAL: 60 PERIODS

OUTCOMES:
- Will be familiar in basic concepts in polymer and its application in the field of electronics
- Will be exposed to composites and their constituents
- Will posses in-depth knowledge about speciality materials
- Will be acquint in the fabrication of integrated circuits and printed circuit boards
- Will be conversant in the theories involved in batteries and its applications

REFERENCES:
OBJECTIVES:
- To get a clear understanding of object-oriented concepts.
- To give introduction about objects and classes
- To understand the concept of inheritance and polymorphism
- Introduction about templates and exception handling
- To give concepts of input and output stream

UNIT I OOP AND C++ FUNDAMENTALS 9

UNIT II OBJECTS AND CLASSES 9
Specifying a Classes – Defining Member Functions – Static data member and member function - Array of objects – Object as function argument - Returning Objects – Friend function - pointers to object - This pointer – Constructor and destructor

UNIT III INHERITANCE AND POLYMORPHISM 9
Derived class - Single Inheritance - Multiple Inheritance - Hierarchical Inheritance - Hybrid Inheritance – Virtual base class - Constructors in Derived class – Nesting of classes - Polymorphism – Compile and Run time polymorphism – Function overloading - Operator Overloading – Virtual Functions

UNIT IV TEMPLATES AND EXCEPTION HANDLING 9
Exception handling mechanism – Rethrowing an Exception – Specifying Exceptions – Templates – Class Template – Function Template – Member function template – Non-Type Template arguments - Namespaces

UNIT V INPUT/OUTPUT STREAMS 9
Input / Output operations – I/O stream classes – Unformatted and formatted I/O operations – Manipulators – Overloading the insertion and extraction operators - File input/output – Command line arguments

TOTAL: (45 + 30) 75 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors and destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of I/O stream classes, file handling and command line arguments

REFERENCES:


**XC5252 DATA STRUCTURES L T P C**

**OBJECTIVES:**
- To learn the concepts of array, stack and Queue and its applications
- To learn about linked list, circular linked list, to implement stack and queue using linked list
- To understand the concept of graph and trees, its representation and its application
- To learn the concept of advanced tree structures
- To learn the systematic way of solving problems, various methods of organizing large amounts of data and to efficiently implement the different data structures and solutions for specific problems

**UNIT I STACKS AND RECURSION**
- Arrays and its representations – Stacks and Queues – Applications of Stack and Queue – Recursion.

**UNIT II LINKED LISTS**
- Linked lists – Linked list based implementation of Stacks and Queues - Circular Linked lists - Linked list based polynomial addition.

**UNIT III GRAPHS AND TREES**

**UNIT IV ADVANCED TREE STRUCTURES**

**UNIT V SORTING AND SEARCHING**

**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
- understand the concept of various non-linear data structures
- understand the properties of advanced tree structures
- design and employ appropriate data structures for solving computing problems

**REFERENCES:**

XC5253 COMPUTER ARCHITECTURE

OBJECTIVES:
- To understand the structure, function and characteristics of computer systems
- To understand the design of the various functional units and components of computers
- To identify the elements of modern instructions sets and their impact on processor design
- To explain the function of each element of a memory hierarchy
- To identify and compare different methods for computer I/O

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

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
- understand basic structure of computer.
- perform computer arithmetic operations.
- understand control unit operations.
- design memory organization that uses banks for different word size operations.
- understand the concept of cache mapping techniques
- understand the concept of I/O organization.
REFERENCES:

XC5261 DATA STRUCTURES LABORATORY

1. Arrays and structures in C
2. Implementation of Stack using Arrays & Pointers
3. Infix to Postfix Conversion & Infix to Prefix Conversion
4. Evaluation of Postfix Expression
5. Implementation of Queue using Arrays & pointers
6. Linked list, Circular Linked list
7. Representations of Graphs
8. Binary Search Tree & its Traversals
9. Insertion sort, Selection Sort, Binary Tree Sort, Heap Sort
10. Sequential Search and Binary Search
11. Index based search

TOTAL: 60 PERIODS

MA5351 LOGIC AND ABSTRACT ALGEBRA

OBJECTIVES:
- To introduce Mathematical Logic to understand the equivalence of statements and normal forms.
- To acquaint the students with Inference Theory and predicate calculus.
- To introduce relations and functions in sets to understand partial order and partition.
- To provide exposure to Algebraic structures.
- To explain the lattice structure and Boolean Algebra

UNIT I MATHEMATICAL LOGIC I
UNIT II MATHEMATICAL LOGIC II
Predicate Calculus – Proof methods and strategy - Inference theory for statement calculus and predicate calculus – Mathematical Induction.

UNIT III RELATIONS AND FUNCTIONS

UNIT IV GROUPS
Groups – Definitions and Examples – Subgroups and Homomorphism – Cosets and Lagrange’s theorem – Normal Subgroups.

UNIT V LATTICES

OUTCOMES:
At the end of the course, students will be able to
- Apply mathematical logic to understand the equivalence and implication of the statements.
- Apply logical inference theory to find the validity of the argument or proof of theorem.
- Understand relations and functions and their composition in applying mapping related problems.
- Apply Boolean laws in solving combinatorial circuit related problems.

REFERENCES:

XC5351 COMBINATORICS AND GRAPH THEORY

OBJECTIVES:
- To introduce fundamental principles of Combinatorial Counting techniques
- To explain generating functions and their utility in solving recurrence relations
- To introduce graph models with basics and tree structures
- To explain the significance of graph connectivity and graph traversability
- To provide the basic theory of Matching, Planar graphs and Graph Coloring

UNIT I FUNDAMENTAL PRINCIPLES OF COUNTING
UNIT II  GENERATING FUNCTIONS AND RECCURENCE RELATIONS  12

UNIT III  INTRODUCTIN TO GRAPHS AND TREES  12
Graphs and Graph models - Connected Graphs – Common classes of graphs – Multigraphs and digraphs – Degree of a vertex – Degree Sequence - Graph Isomorphism – Graph Isomorphism as Relation – Bridges – Trees – Minimum Spanning Tree Problem.

UNIT IV  CONNECTIVITY AND TRAVERSABILITY  12
Cut-vertices – Blocks – Connectivity – Eulerian Graphs – Hamiltonian Graphs

UNIT V MATCHING, PLANARITY AND COLORING  12
Matchings – Planar Graphs – Vertex Coloring – Edge Coloring

TOTAL: 60 PERIODS

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

- Apply the fundamental principles of counting techniques in combinatorial related problems.
- Solve recurrence relations which appear in many context of Computer Science and Combinatorics.
- Apply the structural ideas of Trees and graph isomorphism in solving real world problems.
- Apply the graph connectivity and graph traversability in many traversal and graph construction problems.
- Apply matching, planarity and coloring ideas in many circuit layout and partitioning problems.

REFERENCES:

XC5352  MICROPROCESSOR AND APPLICATIONS  L T P C 3 0 2 4

OBJECTIVES:

- To know about the architecture and related aspects of 8085.
- To know about the architecture and related aspects of 16-bit processor 8086.
- Learn to write simple programs for both 8086 and 8085 processors
- To develop an in-depth understanding of interfacing techniques
- To understand about different interfacing IC’s available

UNIT I  INTRODUCTION AND INTEL 8085  9
UNIT II 16 – BIT PROCESSORS(INTEL8086)
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 MICRO CONTROLLERS

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 IC’S
(i) 8255-Programmable Peripheral Interface along with 8085
(ii) 8254 – Programmable Interval Timer along with Intel8086
(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 based systems.
- Learn the design of microcontrollers-based systems.
- Design the processor with appropriate interface selection.

REFERENCES:

XC5353 OPERATING SYSTEMS

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OBJECTIVES:
- To provide a clear understanding of the concepts that underlies 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.
- To understand the concept of file and directory structures.
- 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  10

UNIT II  PROCESS MANAGEMENT  10
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  9

UNIT IV  FILE SYSTEM  11

UNIT V  CASE – STUDY: LINUX AND WINDOWS OPERATING SYSTEMS  5

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

REFERENCES:
OBJECTIVES:
- To understand the concepts of signals and systems
- To design simple systems for generating and demodulating frequency modulated signals
- To understand analog to digital conversion techniques and coding techniques
- To analyze pulse modulation and multiplexing techniques
- To understand the digital modulation and transmission techniques

UNIT I SIGNALS AND SYSTEM ANALYSIS 12

UNIT II ANALOG MODULATION TECHNIQUES 12

UNIT III ANALOG TO DIGITAL CONVERSION AND CODING TECHNIQUES 12

UNIT IV PULSE MODULATION AND MULTIPLEXING 12

UNIT V DIGITAL MODULATION AND TRANSMISSION 12
Shift Keying Techniques – Binary ASK, Binary FSK, Binary PSK, QPSK – Modulation and Demodulation Principles – Comparison in terms of Bandwidth and Bit Error Rate.

OUTCOMES:
Upon successful completion of this course, students will be able to:
- determine the performance of analog modulation schemes
- determine the performance of systems for generation and detection of modulated analog signals
- determine the performance of analog communication systems
- understand the characteristics of pulse amplitude modulation, pulse position and code modulation systems
- analyze the different shift keying techniques for modulation and transmission

REFERENCES:
XC5361 OPERATING SYSTEMS LABORATORY

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

XC5362 PYTHON PROGRAMMING LABORATORY

- Introduction to Python: functions – control structures – debugging
- Strings : Scope – mutable and immutable objects – recursion
- Classes and files : files and exceptions – classes – list manipulations

TOTAL: 60 PERIODS

MA5451 PROBABILITY AND STATISTICS

OBJECTIVES:
- To introduce the idea of one dimensional and two dimensional random variables and the associated properties of their distribution functions
- To impart knowledge of certain special distribution with examples relating to real time situations.
- To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions
- To establish relationship that make it possible to predict one or more variable in terms of others using correlation and regression analysis

UNIT I PROBABILY DISTRIBUTIONS

UNIT II SPECIAL DISTRIBUTIONS
Discrete Uniform Distribution - Bernoulli Distribution - Binomial Distribution - Poisson Distribution - Uniform Distribution - Gamma, Exponential and Chi Square Distributions - Normal Distribution

UNIT III ESTIMATION THEORY

UNIT IV HYPOTHESIS TESTING
Sampling Distributions- Central Limit Theorem - Testing a Statistical Hypothesis - Tests Concerning Means, Differences Between Means, Variances, Analysis of $r \times c$ Table - Goodness of Fit

UNIT V REGRESSION AND CORRELATION
Linear Regression - Method of Least Squares - Normal Regression Analysis - Normal correlation Analysis - Multiple Linear Regression

TOTAL : 60 PERIODS

OUTCOMES:
• It enables the students to understand the nature and properties of density functions and hence determine the moments and moment generating functions of any random variable
• It helps the students to choose appropriate distribution for the real time problems and hence interpret the analysis mathematically
• It make the students to obtain the value of the point estimators using the method of moments and method of maximum likelihood
• It imparts the knowledge of various test statistics used in hypothesis testing for mean and variances of large and small samples
• It equips the students to determine the regression line using the method of least square and also to calculate the partial and multiple correlation coefficient for the given set of data points

REFERENCES:

XC5451 THEORY OF COMPUTATION

OBJECTIVES
• To introduce finite state automata as language acceptor of regular sets.
• To introduce context free grammars and context free languages and their normal forms.
• To explain pushdown automata as the language acceptor of context-free language.
• To demonstrate Turing machine as a mathematical model of language acceptor of recursively enumerable language and computer of computing number theoretic functions.
• To explain the Chomsky hierarchy among the formal languages.
UNIT I  REGULAR SETS AND FINITE STATE AUTOMATA  12
Finite state automata - Deterministic and non-deterministic model – Languages accepted by Finite State Automata - Regular Expression - Pumping Lemma for regular set.

UNIT II  CONTEXT FREE LANGUAGE  12
Grammar - Context Free Grammars - Derivation trees - Simplification of context - Free grammar (only Construction and no proof of equivalence of grammars) - Chomsky normal Form - Greibach Normal Form.

UNIT III  PUSH DOWN AUTOMATA AND PROPERTIES OF CONTEXT FREE LANGUAGES  12
Pushdown automata - Push down automata and Context free languages - Pumping lemma for context free languages.

UNIT IV  TURING MACHINE AND UNDECIDABILITY  12
Turing Machine model - Computational languages and functions - Modifications of Turing machines (only description, no proof for theorems on equivalence of the modification) - Problems - Properties of recursive and recursively enumerable languages - Universal Turing Machine and the undecidable problem.

UNIT V  THE CHOMSKY HIERARCHY  12
Regular grammar - Unrestricted grammar - Context Sensitive languages - Linear bounded automata - Relation between classes of languages.

TOTAL: 60 PERIODS

OUTCOMES
At the end of the course, students will be able to
- Design finite state automata to accept regular sets.
- Form context free grammar to generate context free language and able to obtain its normal form.
- Design pushdown automata to accept a context free language.
- Design Turing machine to accept recursive enumerable language, to compute number theoretic functions and able to understand the limitation of Turing computing model.
- Understand overall set theoretical relationship of formal languages.

REFERENCES:

XC5452 DATABASE MANAGEMENT SYSTEMS  L T P C 3 0 0 3

OBJECTIVES:
- Comprehend the Fundamental Concepts of Data Base Management Systems
- Data Modeling and mapping using Entity Relationship Model and Enhanced Entity Relationship Model
- Comprehend Fundamental knowledge about Relational Algebra
- Comprehend to work with SQL Queries and need of concurrency control
- Understand the need for Normalization and Normalize Relations

Attested

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UNIT I  INTRODUCTION AND CONCEPTUAL DATA MODELING

UNIT II  RELATIONAL DATA MODELS

UNIT III  STRUCTURED QUERY LANGUAGE

UNIT IV  NORMALIZATION

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.
• Compare and contrast the object oriented model with the E-R and EER models
• Explain the properties of relations and Discuss the first normal form, second normal form, and third normal form
• Use normalization to decompose our relation with anomalies into well structured relations
• Explain how to select an appropriate file organization by balancing various important design factors

REFERENCES:
OBJECTIVES:
- To understand the need for object oriented approach towards programming
- To help 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.
- To stress the need for security in developing applications

UNIT I  JAVA FUNDAMENTALS  9

UNIT II  APPLETS AND GUI  9

UNIT III  THREADING AND NETWORKING  9

UNIT IV  MARKUP AND SCRIPTING LANGUAGES  9

UNIT V  SERVER SIDE PROGRAMMING  9
Database Connectivity – JDBC – Servlets – Java Server Pages – Session Handling–Cookies

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 identifies, automatic documentation through comments, error exception handling)
- Ensure security in the applications being developed
- Develop applications that are platform independent, language independent.

REFERENCES:
OBJECTIVES:

- To understand the division of network functionality into layers
- To understand the TCP/IP protocol suite
- To understand the flow of data between the nodes and building blocks of networks
- To learn flow control and congestion control algorithms
- To understand the network addressing techniques

UNIT I  FUNDAMENTALS


UNIT II  MAC LAYER


UNIT III  NETWORK LAYER


UNIT IV  TRANSPORT LAYER

- Process – To – Process Delivery: UDP, TCP, SCTP – Congestion Control and QOS

UNIT V  APPLICATION LAYER

- Layer 7 Protocols – DHCP, DNS, TELNET, E-mail, FEP, WWW and HTTP, SNMP – Network Security.

OUTCOMES:

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

- identify the components required to build different types of networks
- trace the flow of information from one node to another node in the network
- identify the classes of Network address
- choose functionalities at each layer for different applications
- evaluate the protocols in network layer from QOS perspective

REFERENCES:

XC5461  JAVA AND INTERNET PROGRAMMING LABORATORY  

1. Java Classes and Objects  
2. Inheritance and Polymorphism  
3. Packages, Interfaces and Exception Handling  
4. GUI Programming (Swing, 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,PHP,ASP.NET)  

TOTAL: 60 PERIODS

XC5462  DATABASE MANAGEMENT SYSTEMS LABORATORY  

3. Set Operations – Creating Views – Creating Sequence – Indexing  
4. Aggregate Functions – Analytic Functions – Nested Queries  
5. Creating Triggers and Stored Procedures  
6. Accessing and Updating a Relational Database using PHP  
7. Case Studies – Social Networking Applications  

TOTAL: 60 PERIODS

XC5463  COMPUTATIONAL LABORATORY USING R  

Implement the following using R:  
1. Classification and tabulation of data and graphical and diagrammatic presentation of data  
2. Perform calculation that measures the central tendency and dispersion of data and implementation of measures of skewness, moments and kurtosis.  
3. Determination of point and interval estimations.  
4. Regression analysis and Correlation  
5. Plotting of various distributions.  
6. Implementation of central limit theorem  
7. Case study: complete statistical analysis on any real time dataset  

TOTAL: 60 PERIODS
OBJECTIVES:
- To introduce the students the basic number theory concepts and algorithms related to cryptography.
- Learn the existing crypto-systems and develop problem-solving skills for cryptographic problems and applications.
- To introduce the science and study of methods related to data protection in 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.
- Learn various methods of encrypting data for security purposes.

UNIT I INTRODUCTION TO NUMBER THEORY

UNIT II CONVENTIONAL ENCRYPTION
- Conventional encryption model – Cryptanalysis and brute force attack – Substitution Techniques – Caesar cipher, Monoalphabetic cipher, Playfair cipher, Hill Cipher, Polyalphabetic ciphers, one-Time pad – Transposition Techniques.

UNIT III BLOCK CIPHERS CRYPTOGRAPHY

UNIT IV PUBLIC KEY CRYPTOGRAPHY

UNIT V HASH FUNCTION AND DIGITAL SIGNATURES

TOTAL: 60 PERIODS

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.
- Have knowledge about digital signatures and its standards.

REFERENCES:

XC5551 SOFTWARE ENGINEERING

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.
• To understand the importance of analysis and design
• To stress the need for testing before deployment
• To familiarize the functions of a software project manager

UNIT I INTRODUCTION

UNIT II REQUIREMENT ENGINEERING AND SYSTEM MODELING

UNIT III SOFTWARE DESIGN AND IMPLEMENTATION

UNIT IV SOFTWARE TESTING AND QUALITY ASSURANCE

UNIT V SOFTWARE PROJECT MANAGEMENT

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.
• collect and analyse user requirements using a formalism such as UML, including business process modeling.
• 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.
REFERENCES:

XT5551 DATA WAREHOUSING AND MINING

OBJECTIVES:
- To Create a clean, consistent repository of data within a data warehouse for large corporations
- To explore how data warehousing are explored in business analytics
- To utilize various techniques developed for data mining to discover interesting patterns in large databases
- To expose students to the important functionalities of data mining
- To understand the applications of data mining and its trends

UNIT I DATA WAREHOUSING
Data warehousing Components – Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata

UNIT II BUSINESS ANALYSIS
Reporting and Query tools and Applications - Online Analytical Processing (OLAP) – Need for OLAP - Multidimensional Data Model – OLAP Guidelines – Categories of OLAP tools – Patten and Models.

UNIT III DATA PREPROCESSING & ASSOCIATION RULE MINING

UNIT IV CLASSIFICATION & CLUSTER ANALYSIS

UNIT V OUTLIER DETECTION, APPLICATIONS AND TRENDS
Outlier Detection: Outliers and Outlier Analysis - Outlier Detection Methods - Statistical Approaches - Proximity-Based Approaches - Clustering-Based Approaches - Classification-Based Approaches. Mining Complex Data Types - Other Methodologies of Data Mining - Data Mining Applications - Data Mining Trends .

TOTAL: (45+30) 75 PERIODS
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
- design a OLAP data model and understand the process required to construct
- find some interesting rules along with preprocessing techniques in real time dataset
- understand the details of different algorithms made available and commercial data mining software
- obtain hands-on experience with some popular data mining tools.

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OBJECTIVES:
- To introduce asymptotic notations and growth of functions for understanding of running time of algorithms.
- To explain the design of sorting algorithms with correctness and complexity.
- To provide details of design, correctness and the complexity of fundamental Graph Algorithms.
- To introduce string matching algorithms with correctness and complexity
- To explain classification of problems based on the computational complexity

UNIT I  ANALYZING ALGORITHMS  12
Algorithms – Analyzing algorithms – Designing algorithms – Growth of functions Recurrences

UNIT II  SORTING  12

UNIT III  GRAPH ALGORITHMS  12

UNIT IV  STRING MATCHING  12
The naïve string-matching algorithm – String matching with finite automata – The Knuth-Morris – Pratt algorithm

UNIT V  NP COMPLETENESS  12

TOTAL: 60 PERIODS
OUTCOMES:
At the end of the course, students will be able to
- Describe the complexity of algorithm with appropriate asymptotic notations.
- Use efficient sorting algorithms with comparison as the basic operation for solving sorting problems.
- Use the fundamental graph algorithms in solving optimization problems.
- Use efficient string matching algorithms in string matching problems.
- Able to recognize the complexity class of the given computational problems.

REFERENCES:

XC5561 SOFTWARE DEVELOPMENT LABORATORY

1. Feasibility Study
2. Requirements Engineering
3. Requirements Analysis
4. Software Design using UML
5. Software Implementation
6. Software Testing

A mini project comprising of the above mentioned phases of software development.

TOTAL: 60 PERIODS

XC5651 OPERATIONS RESEARCH

OBJECTIVES:
- To introduce Linear Programming and their methods
- To provide Integer Programming Algorithms
- To give exposure to Non-Linear programming with applications
- To explain the significance of Decision and Game Theory
- To provide Dynamic Programming with applications

UNIT I LINEAR PROGRAMMING

UNIT II INTEGER PROGRAMMING
Introduction – Cutting plane Algorithm – Branch and Bound Algorithm – Zero-one Programming- Goal programming.
UNIT III  NON-LINEAR PROGRAMMING  12
Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn-Tucker conditions – Quadratic programming - Replacement models - Inventory Problems.

UNIT IV  DECISION AND GAME THEORY  12
Decision making under certainty – Decision making under risk – Decision making under uncertainty – Decision tree analysis - Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP

UNIT V  DYNAMIC PROGRAMMING  12

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
- develop the skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling framework
- understand of the role of algorithmic thinking in the solution of operations research problems
- able to build and solve Transportation Models and Assignment Models
- understand Operations Research models and apply them to real-life problems
- interpret the solutions and infer solutions to the real-world problems.

REFERENCES:

XC5601  PRINCIPLES OF COMPILER DESIGN  L T P C
3 0 0 3

OBJECTIVES:
- To know about the steps involved in any language processing system
- To understand the phases of the compiler and its implementation issues
- To learn the memory management during run time environment
- 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

UNIT II SYNTAX ANALYSIS AND INTERMEDIATE CODE GENERATION

UNIT III RUN – TIME ENVIRONMENT

UNIT IV CODE GENERATION

UNIT V MACHINE-INDEPENDENT OPTIMIZATIONS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
- implement all phases of the compiler
- design and implement techniques used for optimization of a compiler.
- modify the existing data structures of an open source optimizing compiler.
- design and implement new data structures and algorithms for code optimisation.
- write programmes in LEX and YACC tools.

REFERENCES:

XT5651 WEB TECHNOLOGY

OBJECTIVES:
- To understand about client-server communication and protocols used during communication.
- To design interactive web pages using Scripting languages
- To learn server side programming using servlets and JSP
- To develop web pages using XML/XSLT
- To understand Ajax technology and web services
UNIT I  WEB SITE BASICS AND HTML

UNIT II  SERVER SIDE SCRIPTING

UNIT III  SERVER SIDE SCRIPTING

UNIT IV  JSP AND XML

UNIT V  AJAX AND WEB SERVICES

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design simple web pages using markup languages like HTML and XHTML.
- Create dynamic web pages using DHTML and javascript that is easy to navigate and use.
- Program server side web pages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.
- Understand various web services and how these web services interact.

REFERENCES:
OBJECTIVES

- To know about the basics of Artificial Intelligence
- To know about the various applications of AI
- To learn about the different search strategies in AI
- To learn about intelligent computing algorithms
- To learn to represent knowledge in solving AI problems

UNIT I  BASICS OF ARTIFICIAL INTELLIGENCE  9

UNIT II  SEARCHING STRATEGIES  9

UNIT III  KNOWLEDGE REPRESENTATION  9
Types of Knowledge – Role of Knowledge – Semantic Nets – Frames – Propositional Logic – Predicate Logic – Semantic Web – Computational Knowledge Discovery – Ontology – Communication of Knowledge – Common Sense

UNIT IV  INTELLIGENT COMPUTING  9

UNIT V  INTELLIGENT AGENTS  9

OUTCOMES:
Upon completion of the subject, students will be able to:
- Understand the different AI systems
- Use appropriate search algorithms for any AI problem
- Represent a problem using first order and predicate logic
- Provide the appropriate agent strategy to solve a given problem
- Design software agents to solve a problem

REFERENCES:

XC5611  COMPILER DESIGN LABORATORY  L T P C
0 0 4 2

Implementation of the following using compiler construction tools and C programming
1. Tokenizer with LEX for declarations in C language
2. Tokenizer with LEX for assignment statement
3. Parser with LEX and YACC to validate “for” statement
4. Evaluation of arithmetic expression with LEX and YACC.
5. Symbol table creation from a list of declarations.
6. Syntax tree creation for “if” statement
7. Three address code generation for simple statements using LEX and YACC
8. Three address code generation for array assignments and while statements using LEX and YACC
9. Translation of three address code to assembly language with fixed number of registers
10. Implement a prototype compiler for a subset of an existing language, as a mini-project.

TOTAL: 60 PERIODS

MA5851  ADVANCED STATISTICAL METHODS FOR COMPUTING  L T P C
4 0 0 4

OBJECTIVES:
- This course provides a sound and rigorous treatment of the basic principles for a proper understanding of the subject matter and for confidence in applying these principles to practical problem solving
- This course provides a solid undergraduate foundation in Time series Analysis and provides an indication of the relevance and importance of the theory in solving real world problems
- To enable the students to use the concepts of multivariate normal distribution and principle components analysis
- To provide information about Estimation theory and regression lines
- To enable the students to use the concepts of design of experiments and factorial design

UNIT I  NONPARAMETRIC TESTS  12

UNIT II  DESIGN OF EXPERIMENTS  12
Analysis of Variance - One-way and two-way Classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design – 2² Factorial Design – Taguchi’s Robust Design

UNIT III  STATISTICAL QUALITY CONTROL  12
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts)
Tolerance limits – Acceptance sampling
UNIT IV  TIME SERIES  12
Components of Time Series – Analysis of Time series – Measurement of Trend – Measurement of Seasonal Fluctuations

UNIT V  MULTIVARIATE ANALYSIS  12
Random vectors and Matrices - Mean Vector and Covariance Matrices - Partitioning of Covariance Matrices - Combination of Random Variables for Mean Vector and Covariance Matrix - Multivariate, Normal Density and its Properties - Principal Components: Population principal components - Principal components from standardized variables.

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

- The ability to use the appropriate and relevant, fundamental and applied mathematical and statistics knowledge and methodologies in solving practical problems.
- The ability to bring together and flexibly apply knowledge to characterise, analyse and solve a wide range of problems.
- An understanding of the balance between the complexity/accuracy of the mathematical/statistical models used and the timeliness of the delivery of the solution.
- The ability to steeped in research methods and rigor.
- Critical thinking based on empirical evidence and the scientific approach to knowledge development.
- The students can independently participate in the processes of analysis, planning, formulating strategies of development, decision-making, governing and management, and independent making of tactical and strategic decisions related to the statistic.

REFERENCES:

XT5851  BIG DATA ANALYTICS  L T P C
3 0 2 4

OBJECTIVES:
- Introduce big data analytics concepts, its life cycle, challenges, application areas, tools and platforms.
- To study classification and clustering techniques for analyzing big data.
- To introduce analytical theory and methods and recommendation system.
- To study in detail about Hadoop and data management for big data.
- To know about graphical analysis for big data using case studies.
UNIT I     INTRODUCTION TO BIG DATA ANALYTICS
Big Data Overview - State of the Practice in Analytics - Key Roles for the New Big Data Ecosystem - Data Analytics Lifecycle Overview – Phases of life cycle – GINA – Big data Challenges – Application area – Application Tools and Platforms.

UNIT II     ADVANCED ANALYTICAL THEORY AND METHODS

UNIT III  ASSOCIATION AND RECOMMENDATION SYSTEM

UNIT IV     HADOOP AND NoSQL DATA MANAGEMENT FOR BIG DATA

UNIT V     GRAPH ANALYTICS AND CASE STUDY
The Simplicity of the Graph Model- Representation as Triples – Graphs and Network Organization – Choosing Graph Analytics – Graph Analytics Use Cases – Graph Analytics Algorithms and Solution Approaches – Technical Complexity of Analyzing Graphs- Features of a Graph Analytics Platform – Big data application and case study – Big data in scientific applications – Big data in Health care.

TOTAL: (45+30) 75 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
• Work with big data tools and its analysis techniques
• Design efficient algorithms for mining the data from large volumes
• Design an efficient recommendation system
• Design the tools for visualization
• Learn NoSQL databases and management

REFERENCES:

Attested

[Signature]

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OBJECTIVES:

- To introduce the working structure of distributed computing
- To understand the process of virtualization
- To understand virtualization management with respect to storage and networks
- To familiarize the cloud platform architecture
- To have an overview on cloud storage providers

UNIT I  BASICS OF DISTRIBUTED COMPUTING
Introduction to Distributed computing – Models of distributed computation - Message Ordering and Group Communication; Termination Detection Reasoning with Knowledge; Distributed Mutual Exclusion - Deadlock Detection- Global Predicate Detection; Distributed Shared Memory

UNIT II  VIRTUALIZATION

UNIT III  VIRTUALIZATION MANAGEMENT

UNIT IV  CLOUD PLATFORM ARCHITECTURE

UNIT V  CLOUD STORAGE & SECURITY
Overview of cloud storage - Cloud storage providers - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus - Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

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

- Understand the basics of distributed computing
- Gain knowledge on virtualization
- Understand and apply storage and network virtualization
- Develop new cloud platform architectures
- Work with cloud storage providers using real time scenarios

REFERENCES:
OBJECTIVES:
- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation
- To identify the causes and effects on environmental pollution and natural disasters
- To impart knowledge on renewable and non-renewable resources by employing sustainable measures for their preservation
- To have a sound knowledge on the long and short term environmental issues
- To familiarize the students on human value education, consumerism and role of technology in environmental issues.

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  10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.
UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT

OUTCOMES:
- Will be exposed to the functions of environment, ecosystems and biodiversity and their conservation
- Will be acquitted with the causes and effects of environmental pollution and natural disasters
- Will be familiar on renewable and non-renewable resources by employing sustainable measures for their preservation
- Will recognize the different forms of energy and apply them for societal development
- Will have a sound knowledge on the long and short term environmental issues
- Will be familiarized on human value education, consumerism and role of technology in environmental issues

REFERENCES:

MA5951  NUMERICAL METHODS

OBJECTIVES:
- To provide the mathematical foundations of numerical techniques for solving Eigen value problems and linear system of equations.
- To apply the techniques of interpolation for equal and unequal intervals for the given data.
- To understand and to apply the techniques of numerical integration and differentiation for solving and ODE in applying day today life.
- To familiar in solving initial value problems and ODE for given initial and boundary conditions.
- To demonstrate to utility of Numerical techniques of solving Partial Differential Equations in Heat and Fluid problems.
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
Numerical differentiation with interpolating polynomials, Numerical integration by Trapezoidal and Simpson’s 1/3rd rule. Double integrals using Trapezoidal and Simpson’s rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

UNIT V BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
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

OUTCOMES:
Upon completion of this course, the students will be able to:
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to the algebraic and transcendental equations.
- Apply numerical methods to obtain approximate solutions to mathematical problems using interpolation.
- Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods in solving ODE of First and Second order equations.
- Understand various numerical techniques for solving PDE, for given conditions in Heat and Fluid flow problems.

REFERENCES:
OBJECTIVES:
- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To build IoT using Raspberry Pi
- To build IoT with Galileo and Arduino
- To apply the concept of Internet of Things in the real world scenario

UNIT I  FUNDAMENTALS OF IoT
Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs M2M

UNIT II  IoT DESIGN METHODOLOGY
IoT systems management – IoT Design Methodology – Specifications Integration and Application Development

UNIT III  BUILDING IOT WITH RASPBERRY PI
Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services

UNIT IV  BUILDING IOT WITH GALILEO/ARDUINO
Intel Galileo Gen2 with Arduino Interfaces - Arduino IDE – Programming - APIs and Hacks

UNIT V  CASE STUDIES AND ADVANCED TOPICS
Various Real time applications of IOT- Connecting IOT to cloud – Cloud Storage for IOT – Data Analytics for IOT – Software & Management Tools for IOT

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of the course the student should be able to:
- Have a broad understanding of designs, protocols and IoT levels
- Design a portable IOT using Arduino/ equivalent boards and relevant protocols
- Develop web services to access/control IOT devices
- Deploy an IOT application and connect to the cloud
- Analyze applications of IOT in real time scenario

REFERENCES:
OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To have a thorough understanding of the Supervised and Unsupervised learning techniques.
- To study the various probability based learning techniques
- To understand graphical models of machine learning algorithms
- To work on real life case studies and process datasets to extract knowledge

UNIT I  
BASICS OF MACHINE LEARNING


UNIT II  
LEARNING MODELS

Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison - Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models - Bayesian Logistic Regression.

UNIT III  
ARTIFICIAL NEURAL NETWORKS

Feed-Forward Network Functions – Network Training – Error Back propagation – Hessian Matrix – Regularization – Mixture Density Networks – Bayesian Neural Networks

UNIT IV  
DEEP LEARNING

Common Architectural Principles – Building Blocks - Unsupervised Pretrained Networks – Convolutional Neural Networks – Recurrent Neural Networks – Recursive Neural Networks

UNIT V  
APPLICATIONS AND CASE STUDIES


TOTAL: (45+30) 75 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
- 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.

REFERENCES:

Implement the following algorithms:

1. Gaussian Elimination method
2. Gauss - Jacobi and Gauss - Seidal methods
3. Power methods
4. Lagrange’s interpolation
5. Newton – cotes Formulae
6. Gaussian Quadrature
7. Spline Approximation
8. 4\textsuperscript{th} order Runge – kutta method
9. Milne Thomson and Adams BASHFORTH Methods

TOTAL: 60 PERIODS

XT5961
INTERNET OF THINGS LABORATORY

Working with Arduino – configuring basic sensors – getting data from sensors – processing the data –
Working with Raspberry Pi – Activating lights/actuators/motors based on the sensor data
Suggested list of applications

1. Automatic Street Lighting system
2. Smart Water Monitoring system
3. Automatic Smart Parking system
4. Multi Room Music Player using IoT
5. Smart Home Monitoring system

TOTAL: 60 PERIODS

XT5071
.NET PROGRAMMINING

OBJECTIVES:

- To learn basic concepts in in C#.
- To Know the object oriented aspects of C#.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP.NET.
- To introduce advanced topics namely data connectivity, WPF, WWF and WPF with C# and .NET 4.5.
- To implement mobile applications using .NET compact framework.

UNIT I
C# LANGUAGE BASICS
.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts - Indexers

UNIT II
C# ADVANCED FEATURES
Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection
UNIT III  BASE CLASS LIBRARIES AND DATA MANIPULATION  9
Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML-
SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer
Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF)

UNIT IV  WINDOW BASED APPLICATIONS, WCF AND WWF  9
Window based applications - Core ASP.NET- ASP.NET Web forms -Windows Communication
Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows
Workflow Foundation (WPF) - Activities -Workflows

UNIT V  .NET FRAMEWORK AND COMPACT FRAMEWORK  9
Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML -
Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact
Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and
Deployment – Networking and Mobile Devices

OUTCOMES:
On Completion of the course, the students should be able to:
- List the major elements of the .NET Framework
- Analyze the basic structure of a C# application
- Write various applications using C# Language in the .NET Framework
- Develop distributed application using .NETFramework
- Create Mobile Application using .NET compactFramework

REFERENCES:
Publisher, New York, 2015.
2. Andy Wigley, Daniel Moth, Peter Foot, "Mobile Development Handbook", Microsoft Press,
Sebastopol, 2011.
2017.
6. Ian Garifffiths, Mathew Adams, Jesse Liberty, “Programming C# 4.0”,O'Reilly, Fourth Edition,

MA5071  LINEAR ALGEBRA  

OBJECTIVES:
- To acquire the thorough knowledge in vector space, sub spaces, basis and dimensions
- To impart the basic idea of linear transformations, their representation by matrices, geometry of
linear operators and change of basis
- To build a base in the analysis of a single linear transformation on a finite dimensional vector
space; the analysis of characteristics, values and diagonalizable transformations
- To set a base in the study of finite dimensional inner product spaces in detail, orthogonality,
orthogonal projections and the diagonalization
- To follow the required vector space in real time applications such as networks, linear
programming, statistics and probability
UNIT I VECTOR SPACES
Vector spaces and subspaces – Linear combinations and Linear system of equations, Span, Linear independence and dependence - Null space, Column space, and Row space – Basis and dimension of a vector space.

UNIT II LINEAR TRANSFORMATION
Introduction to linear transformations – General Linear Transformations – Rank and nullity - Kernel and range – Matrices of general linear transformation- Geometry linear operators- Change of basis.

UNIT III INNER PRODUCT SPACES

UNIT IV EIGEN VALUES AND EIGEN VECTORS
Introduction to Eigen values- Diagonalizing a matrix- Orthogonal diagonalization-, Applications to differential equations- Positive definite matrices- Similar matrices Quadratic forms-Quadratic surfaces Singular value decomposition.

UNIT V APPLICATIONS

TOTAL: 45 PERIOD

OUTCOMES:
- The student can set up the base in the basic concepts of vector spaces and dimensions
- Able to study completely about linear transformations and matrices
- Will be familiarized with the techniques of diagonalization by inner product spaces
- Made the objectives clear to get the Eigen values and Eigen vectors required for diagonalization
- Be ready to apply the linear algebra concepts of solving real time problems in various fields

REFERENCES:

XT5072 INFORMATION CODING TECHNIQUES

OBJECTIVES:
- To have a complete understanding of error--control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.
UNIT I INFORMATION ENTROPY FUNDAMENTALS 9

UNIT II CHANNEL CAPACITY AND CODING 9
Channel Models - Discrete memory less channels – Channel capacity – Channel coding theorem - Information capacity theorem.

UNIT II ERROR CONTROL CODING 9
Linear block codes – Matrix Description - Equivalent codes – Parity Check Matrix – Decoding of Linear Block Code – Syndrome decoding –Cyclic codes – Generator polynomial – Encoder for cyclic codes – Cyclic Redundancy Check (CRC) codes - Convolutional codes – Tree codes – Trellis codes – Viterbi Decoding of Convolutional codes.

UNIT IV TEXT AND IMAGE COMPRESSION 9

UNIT V AUDIO AND VIDEO CODING 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students would have learnt about:
- Design an application with error-control
- The basic notions of information and channel capacity.
- Convolutional and block codes, decoding techniques
- How error control coding techniques are applied in communication systems.
- Compression techniques for text, image, audio and video

REFERENCES:

XT5073 HUMAN COMPUTER INTERFACE L T P C
3 0 0 3

OBJECTIVES:
- To learn the principles and fundamentals of Human computer interaction (HCI)
- To analyze HCI theories, as they relate to collaborative or social software.
- To establish target users, functional requirements, and interface requirements for a given computer application.
- To understand user interface design principles, and apply them to designing an interface.
- To know the applications of multimedia on HCI.
UNIT I  DESIGN PROCESS 9

UNIT II  DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS 9

UNIT III  MODELS 9

UNIT IV  EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI 9

UNIT V  THEORIES 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to
- interpret the contributions of human factors and technical constraints on human– computer interaction.
- evaluate the role of current HCI theories in the design of software.
- apply HCI techniques and methods to the design of software.
- categorize and carefully differentiate various aspects of multimedia interfaces.
- design and develop issues related to HCI for real application.

REFERENCES:
OBJECTIVES:
- To expose the context and operation of open source software.
- To understand open source operating system and database.
- To learn programming language like: PHP – Python.
- To learn configuration of web servers.
- To learn some important OSS tools.

UNIT I PRINCIPLES OF OPEN SOURCE SOFTWARE

UNIT II OPEN SOURCE OPERATING SYSTEMS AND DATABASE

UNIT III OPEN SOURCE PROGRAMMING LANGUAGES
Introduction to Open Source Programming and Scripting Languages- Execution Environment - Programming in Web Environment - File Handling and Data Storage - Working with Forms - Case Study: PHP - Python.

UNIT IV OPEN SOURCE WEB SERVER

UNIT V TOOLS AND TECHNOLOGIES

OUTCOMES:
Upon completion of the course, the student should be able to:
- install and run open-source operating systems.
- apply the security concept in open source database.
- contribute software to and interact with Free and Open Source Software development projects.
- build and modify one or more Free and Open Source web server’s configuration.
- use a version control system.

REFERENCES:
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


UNIT III TCP AND ATM CONGESTION CONTROL


UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES


UNIT V MPLS NETWORKS


TOTAL: 45 PERIODS

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.
- Understand the concepts of frame relay and ATM.
- Understand the concepts of traffic management in Single server queues.
- Understand the congestion control mechanisms in TCP.
- Understand the integrated and differentiated services and MPLS networks.

REFERENCES:

OBJECTIVES:

- To understand the design of the UNIX operating system
- To become familiar with the various data structures used
- To learn the various low-level algorithms used in UNIX
- To learn about different file systems
- To learn I/O and memory management policies

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

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

UNIT III SYSTEM CALLS FOR THE FILE SYSTEM

UNIT IV PROCESSES

UNIT V MEMORY MANAGEMENT AND I/O
Memory Management Policies - Swapping – Demand paging - The I/O Subsystem - Driver Interface – Disk Drivers – Terminal Drivers

OUTCOMES:
Upon completion of the course, the student should be able:
- To analyze the internals of the Unix operating system.
- To make use of the various data structures.
- To implement various low-level algorithms used in UNIX.
- To design memory management schemes.

REFERENCES:

TOTAL: 45 PERIODS
OBJECTIVES:
- To get the feel of basics of database tuning.
- To learn concepts behind database design optimization.
- To write procedures involving query planning.
- To understand how troubleshooting is done
- To formulate new indexing methods

UNIT I  FUNDAMENTALS OF TUNING  9
Review of Relational Databases – Relational Algebra - Locking and Concurrency Control –
Correctness Consideration – Lock Tuning – Transaction Chopping – Logging and the Recovery
Operating Systems Considerations – Hardware Tuning.

UNIT II  INDEX TUNING  9
Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Comparison of
Indexing and Hashing techniques – Hot Table – Storage Structure Optimization through Index Tuning.

UNIT III  DESIGN AND QUERY OPTIMIZATION  9
Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables –
Aggregate Maintenance – Record Layout – Triggers – Client Server Mechanisms – Types of Queries –
Query Tuning.

UNIT IV  INTERFACE AND CONNECTIVITY TUNING  9
Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data –
Accessing Multiple Databases – ODBC – JDBC Tuning — Case Studies: Tuning E-Commerce
Application – Data Warehouse Tuning.

UNIT V  TROUBLESHOOTING  9
Understanding Access Plans – Analyzing a Query’s Access Plan – Profiling a Query Execution –
Analyzing DBMS Subsystems and Hardware Resources – SQL performance Analyzer – Time Series
Databases – Configuration Parameters: Oracle; SQL Server; DB2UDB.

OUTCOMES:
Upon completion of the course, the students will be able to
- Design databases involving normalization.
- Write optimized code for accessing multiple databases.
- Use tuning tools for different database operations.
- Troubleshoot database issues.
- Use benchmark databases for demonstrating concepts behind database tuning.

REFERENCES:
1. Dennis Shasha and Philippe Bonnet —Database Tuning, Principles, Experiments, and
2. Peter Gulutzan and Trudy Pelzer, —SQL Performance Tuning, Addison-Wesley, First Edition,
Boston, 2002.
3. Richard Niemiec, —Oracle Database 11g Release 2 Performance Tuning Tips and Techniques,
4. Thomas Connolly and Carolyn Begg, —Database Systems: A Practical Approach to Design,
OBJECTIVES:
- To develop an awareness of the need for project planning and management
- To understand workflows of the software management process
- To study about the stages involved in the system development lifecycle process
- To explain the procedures needed to monitor, control and report on quality
- To explain the ways in which project can be done in cost effective ways

UNIT I OVERVIEW OF SOFTWARE PROJECT MANAGEMENT 9
Conventional software management - Evolution of software economics - Improving software economics - Conventional Vs Modern software project management.

UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9
Lifecycle phases - Artifacts of the process - Model based software architectures - Workflows of the process - Checkpoints of the process.

UNIT III SOFTWARE MANAGEMENT DISCIPLINES 9
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 9
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 9
COCOMO Cost estimation model - Change metrics - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
- Develop project that matches the organizational needs to the most effective software development model
- Effectively process project workflow
- Managing people and do effective communications among people and do effective planning to meet changes in software developmental stages.
- Select and employ mechanisms for tracking the software projects and maintaining Quality
- To develop the skills for tracking and controlling software deliverables

REFERENCES:
OBJECTIVES:
- To study how to manage and track the time for software processes and personal life
- To study how to plan a product and how to measure size of a product
- To learn how to schedule a process and how to be committed in work.
- To learn about software Development process and how to produce defect free product.
- To learn how to estimate the product and process quality.

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:
Upon Completion of the course, the students will be able to
- Explain software development life cycle
- Analyze, prioritize, and manage requirements and do scheduling the jobs based on estimation plan
- Design checklist which is used in reducing defect injection in coding and planning
- Identify and prioritize risks in producing quality product
- Do analyze the root cause for defect and will be committed towards quality

REFERENCES:
OBJECTIVES:
- To learn basic concepts of data representation.
- To understand the importance of data visualization.
- To know the different types of visualization techniques.
- To understand the various types of dimensional visualization.
- To create various visualizations

UNIT I  INTRODUCTION TO DATA REPRESENTATION

UNIT II  FOUNDATIONS FOR DATA VISUALIZATION
Visualization stages – Experimental Semiotics based on Perception Gibson’s Affordance theory – Model of Perceptual Processing – power of visual perception-Types of Data-visualization and data objects.

UNIT III  COMPUTER VISUALIZATION
Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces– Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data - Interacting with visualization

UNIT IV  MULTIDIMENSIONAL VISUALIZATION

UNIT V  CASE STUDIES
Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis

OUTCOMES:
Upon Completion of the course, the students will be able
- Understand the fundamentals of data presentation.
- Apply visualization over different types of data.
- To compare various visualization techniques.
- Apply multidimensional visualization techniques for various data analysis tasks.
- Design creative visualizations.

REFERENCES:
OBJECTIVES:
- To learn the fundamental concepts and applications of Digital Image Processing.
- To study about various Filters and its types.
- To understand segmentation and feature analysis processes.
- To understand various compression techniques.
- To learn about image processing applications in recent trends.

UNIT I  FUNDAMENTALS OF IMAGE PROCESSING  9

UNIT II  IMAGE ENHANCEMENT  9

UNIT III  IMAGE SEGMENTATION AND FEATURE ANALYSIS  9

UNIT IV  MULTI RESOLUTION ANALYSIS AND COMPRESSIONS  9

UNIT V  APPLICATIONS OF IMAGE PROCESSING  9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students would have learnt about:
- How to apply the knowledge of mathematics, science, and engineering in image processing.
- How to enhance an image using various filters.
- How to segment an image and extract feature in image to interpret data.
- How to apply compression techniques to an image in processing and transmission.
- How to do analysis for video and how to classify, recognize and do image fusion.

REFERENCES:
OBJECTIVES:

- To learn the basics UNIX OS and IPC.
- To learn the basics of socket programming using TCP and UDP.
- To learn about the Echo Server, Day Time Server and I/O multiplexing.
- To learn about the various socket options.
- To learn to create and implement raw sockets.

UNIT I DISTRIBUTED DATABASES 9

UNIT II ELEMENTARY TCP SOCKETS 9

UNIT III APPLICATION DEVELOPMENT 9

UNIT IV SOCKET OPTIONS, ELEMENTARY UDP SOCKETS 9

UNIT V ADVANCED SOCKETS 9

TOTAL: 45 PERIODS

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

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 9

UNIT II FUZZY SETS AND FUZZY LOGIC 9

UNIT III GENETIC ALGORITHMS 9
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 9

UNIT V APPLICATIONS OF SOFT COMPUTING 9
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
- discuss on machine learning through Neural networks.
- build soft computing models for any given problem
- apply knowledge in developing a Fuzzy expert system
- model Neuro Fuzzy system for clustering and classification.
- discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system.

REFERENCES:

XC5074 NATURAL LANGUAGE PROCESSING

OBJECTIVES:
- To learn the fundamentals of natural language processing
- To appreciate the use of CFG and PCFG in NLP
- To understand the role of semantics and pragmatics
- To understand how to model a language
- To understand how NLP is applied in real world problems

UNIT I INTRODUCTION TO AUTOMATA

UNIT II SPEECH
Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology

UNIT III SYNTAX
Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity

UNIT IV SEMANTICS AND PRAGMATICS
The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse

UNIT V APPLICATIONS
Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

TOTAL: 45 PERIODS

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

75
REFERENCES:

XT5081  INFORMATION SECURITY  L T P C
3 0 0 3

OBJECTIVES:
- To Understand basic information security principles and approaches.
- To Recognize the major information security threats and countermeasures.
- To understand the importance of information security
- To understand the various security protocols
- To design a secure system model

UNIT I  INTRODUCTION TO INFORMATION SECURITY 9

UNIT II  SECURITY INVESTIGATION 9

UNIT III  SECURITY ANALYSIS 9

UNIT IV  LOGICAL DESIGN 9

UNIT V  PHYSICAL DESIGN 9

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.
- About recent information security threats and preventive measures

REFERENCES:

XT5082 ADHOC AND SENSOR NETWORKS  L  T  P  C  3  0  0  3

OBJECTIVES:
- To gain knowledge of mobile ad hoc networks.
- To gain the protocol design issues of the ad hoc and sensor networks.
- 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  9

UNIT II ADHOC MAC LAYERS  9
MAC LAYER – IEEE 802.11 (for wireless LANs) – IEEE 802.15 – Bluetooth technology – Wireless Mesh Networks.

UNIT III ADHOC TRANSPORT LAYERS  9

UNIT IV SENSOR NETWORKS  9
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.

REFERENCES:

XT5083 INFORMATION RETRIEVAL TECHNIQUES

OBJECTIVES:
- To learn the concepts behind IR
- To understand the operation of web search
- To learn the algorithms related to text classification, indexing and searching
- To understand various IR models
- To understand how IR is applied in real world problems

UNIT I  INTRODUCTION TO IR

UNIT II  MODELING AND RETRIEVAL EVALUATION
UNIT III  TEXT CLASSIFICATION, INDEXING AND SEARCHING  9
A Characterization of Text Classification – Unsupervised Algorithms – Supervised Algorithms –
Feature Selection or Dimensionality Reduction – Evaluation metrics – Organizing the classes –
Indexing and Searching – Inverted Indexes – Signature Files – Suffix Trees & Suffix Arrays –
Sequential Searching – Multi-dimensional Indexing.

UNIT IV  WEB RETRIEVAL AND WEB CRAWLING  9
Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and

UNIT V  TYPES OF IR AND APPLICATIONS  9
Parallel and Distributed IR – Data Partitioning – Parallel IR – Cluster-based IR – Distributed IR -
Multimedia Information Retrieval – Challenges – Content Based Image Retrieval – Audio and Music
Retrieval – Retrieving and Browsing Video – Fusion Models – Segmentation – Compression
Enterprise Search – Tasks – Architecture of Enterprise Search Systems – Enterprise Search

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- use an open source search engine framework and explore its capabilities
- represent documents in different ways and discuss its effect on similarity calculations and on
  search
- design and implement an innovative feature in a search engine
- build an IR model
- enhance an existing IR model

REFERENCES:
1. Bruce Croft, Donald Metzler and Trevor Strohman, “Search Engines: Information Retrieval in
4. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, “Information Retrieval:

XT5084  SEMANTIC WEB  L T P C
3 0 0 3

OBJECTIVES:
- To learn the fundamentals of semantic web and to conceptualize and depict Ontology for
  semantic web.
- To make a study of languages for semantic web.
- To learn about the ontology learning algorithms and to utilize in the development of an
  application.
- To know the fundamental concepts of management of ontology.
- To understand the working of ontology models
UNIT I  THE QUEST FOR SEMANTICS  9

UNIT II  LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES  9

UNIT III  ONTOLOGY LEARNING FOR SEMANTIC WEB  9

UNIT IV  ONTOLOGY MANAGEMENT AND TOOLS  9

UNIT V  APPLICATIONS  9

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the students should be able to
- create Ontology for a given domain.
- develop an application using ontology languages and tools.
- perform ontology management effectively
- evaluate different ontology models
- design and develop web service applications using semantic portals.

REFERENCES:
OBJECTIVES:
- To understand the mathematical foundations needed for performance evaluation of computer systems
- To understand the metrics used for performance evaluation
- To understand the analytical modeling of computer systems
- To enable the students to develop new queueing analysis for both simple and complex systems
- To appreciate the use of smart scheduling and introduce the students to analytical techniques for evaluating scheduling policies

UNIT I QUEUEING MODELS
Performance Characteristics – Requirement Analysis: Concepts – User, Application, Device, Network Requirements – Single Queueing systems: M/M/1 Queuing System – Little’s Law – Reversibility and Burke’s theorem – M/M/1/N – M/M/∞ - M/M/m – M/M/m/m – M/M/1/∞ - M/G/1 Queuing System.

UNIT II QUEUEING NETWORKS

UNIT III QUEUES IN COMPUTER SYSTEMS

UNIT IV DISCRETE TIME QUEUEING MODELS

UNIT V NETWORK PERFORMANCE

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 and Define Little’e 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

REFERENCES:

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
Bioinformatics data – Datawarehousing architecture – Data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture – Applications

UNIT III MODELING FOR BIOINFORMATICS
Hidden Markov modeling for biological data analysis – Sequence identification – Sequence classification – Multiple alignment generation – Comparative modeling – Protein modeling – Genomic modeling - Molecular modeling – Computer programs for molecular modeling

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

REFERENCES:

XT5087 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

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

UNIT I INTRODUCTION TO QUALITY

UNIT II TQM PRINCIPLES
Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen service quality frameworks and gaps – Control charts for variables and attributes.

UNIT III TQM TOOLS & TECHNIQUES I

UNIT IV TQM TOOLS & TECHNIQUES II

UNIT V QUALITY SYSTEMS

TOTAL: 45 PERIODS

OUTCOMES:
Upon successful completion of the module students will be able to:
- develop and 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 analyzing quality management issues in the industry.
- assess exactly where an organization stands on quality management with respect to the ISO 9000 quality management standard and the Baldrige Award criteria.
REFERENCES:

XT5088 3G AND 4G WIRELESS NETWORKS  L T P C
3  0  0  3

OBJECTIVES:
- To learn various generations of wireless and cellular networks.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.
- To study about WiMAX networks, protocol stack and standards.
- To understand about the emerging trends of smart phones and evolution of latest standards like DLNA, NFC and femtocells.

UNIT I Basics of Cellular Systems
9
History of Mobile Cellular Systems - First Generation - Second Generation - Generation 2.5 - Overview of 3G & 4G. 3GPP and 3GPP2 standards

UNIT II 3G NETWORKS
9
Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA - CDMA 1X – WCDMA

UNIT III 4G LTE
10

UNIT IV WIMAX NETWORKS
8
Introduction to WiMax Networks – IEEE 802.16 – Frame Format – Protocols - OFDM – MIMO - IEEE 802.20 – Applications

UNIT V DLNA AND NFC REVOLUTION
9

OUTCOMES:
Upon the completion of the course the student should be able:
- To appreciate the evolution of cellular networks.
- To deploy 3G Services.
- To explore the developments in 4G Networks.
- To implement WiMAX networks, protocol stack and standards.
- To explore the need for NFC in future.
REFERENCES:

XC5075 COMPUTATIONAL LINGUISTICS

OBJECTIVES:
- Learn about the statistical modeling and classification for NLP
- Learn the basic techniques of information retrieval
- Know about the basics of text mining
- Learn the generic issues in speech processing and applications relevant to natural language generation
- To understand the problems associated with storage

UNIT I NATURAL LANGUAGE PROCESSING

UNIT II INFORMATION RETRIEVAL
Information Retrieval architecture - Indexing - Storage - Compression techniques - Retrieval approaches - Evaluation - Search Engines - Commercial search Engine features - comparison - Performance measures - Document processing - NLP based Information Retrieval - Information Extraction - Vector Space Model

UNIT III TEXT MINING
Categorization : Extraction based Categorization - Clustering - Hierarchical clustering - Flat Clustering - Document classification and routing - Finding and organizing answers from text search - Categories and clusters for organizing retrieval results - Text Categorization - Efficient summarization using lexical chains - Pattern extraction

UNIT IV GENERIC ISSUES

UNIT V APPLICATIONS
Machine translation - Transfer metaphor - Interlingua and statistical approaches - Discourse processing - Dialog and conversational agents - Natural language generation - Surface Realization and discourse planning.

TOTAL: 45 PERIODS
OUTCOMES:
On completion of the course, the students should be able to
- Develop applications related to speech processing
- Develop applications related to text mining
- Formulate new text mining methods
- Extract patterns in previously existing data
- Solve the issues associated with transmission and storage

REFERENCES:

XT5089 MOBILE AND PERVERSIVE COMPUTING

OBJECTIVES:
- To learn about the basics of wireless communication
- To learn basic concepts and systems issues in telecommunication and satellite systems
- 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 OVERVIEW OF WIRELESS COMMUNICATION

UNIT II TELECOMMUNICATION AND SATELLITE SYSTEMS

UNIT III PERVERSIVE COMPUTING
Introduction - Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing- Pervasive devices-embedded controls - smart sensors and actuators -Context communication and access services
UNIT IV PROTOCOLS

UNIT V TECHNOLOGIES, PLATFORMS AND RECENT TRENDS

OUTCOMES:
At the end of the course the student should be able to
- To deploy better strategies for radio and signal transmission.
- To develop suitable scripts and applications for recent networks.
- To use context aware sensor and mesh networks to develop mobile computing environment.
- To develop better protocols and effective communication mechanism for mobile and context aware computing.
- To develop more system model by using different simulators and design an appropriate mechanism to evaluate the system performance.

REFERENCES:
UNIT III  CAMERA CALIBRATION AND STEREO GEOMETRY  
Camera Parameters – Intrinsic and Extrinsic parameters – Direct Parameter Calibration – Extraction from Projection matrix, Stereopsis – Correspondence Problem – RANSAC and Alignment - Epipolar Geometry

UNIT IV  MOTION DETECTION AND SHAPE FROM CUES  

UNIT V  HIGH LEVEL VISION  
Interpretation trees, Invariants – Appearance and Shape based Classification – 3D object modeling– Matching from Intensity Data – Matching from Range Data – Visual Recognition – AdaBoost and Random Decision Forests.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to
- Apply various filtering techniques in image processing.
- Apply different Detection methods to extract image features.
- Apply calibration parameters to camera for effective vision.
- Use various algorithms to detect motion and shape from cues.
- Use classification techniques to extract appearance and shape of object.

REFERENCES:

UNIT I  OVERVIEW OF BIOMETRICS MECHANISM  

OBJECTIVES:
- To understand the basic ideas and principles in biometrics
- To familiarize the student with scanning mechanism of finger and facial
- To understand the technologies used in iris and voice scan
- To understand the various physiological biometrics used for biometrics application development
- To understand the role of multi-biometrics in industrial applications.
UNIT II  FINGER AND FACIAL SCAN
Finger scan – Features – Components – Operation (Steps) – Competing finger Scan technologies – Strength and weakness. Types of algorithms used for interpretation. Facial Scan - Features – Components – Operation (Steps) – Competing facial Scan technologies–Strength-weakness.

UNIT III  IRIS AND VOICE
Iris Scan - Features – Components – Operation (Steps) – Competing iris Scan technologies – Strength and weakness. Voice Scan - Features – Components – Operation (Steps) – Competing voice Scan (facial) technologies – Strength and weakness.

UNIT IV  PHYSIOLOGICAL BIOMETRICS

UNIT V  BIOMETRICS APPLICATION DEVELOPMENT

OUTCOMES:
Upon Completion of the course, the students should be able to
- Implement customized biometrics mechanism according to end-user needs.
- Analyze finger and facial features and able to use in appropriate applications.
- Analyze iris and voice features and able to use in appropriate applications.
- Analyze other physiological biometrics which can be used for effective security mechanism.
- Analyze and implement different biometrics technologies according to industrial needs or customized individual needs.

REFERENCES:

XT5090   MULTIMEDIA INFORMATION STORAGE AND RETRIEVAL  L T P C
3 0 0 3

OBJECTIVES:
- To introduce the basics of multimedia information storage technology, techniques for analysis, representation and retrieval that is commonly used in industry.
- To compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
- To outline the structure of queries and media elements.
- To critically evaluate Multimedia retrieval system effectiveness and improvement techniques.
- To understand how multimedia storage takes place in real world.
UNIT I FUNDAMENTAL MEDIA UNDERSTANDING

UNIT II TEXT RETRIEVAL AND MUSIC

UNIT III IMAGE RETRIEVAL
Content-base image retrieval techniques – Feature extraction – Integration – Similarity – Feature in indexing – Interactive Retrieval – MPEG-7 standard

UNIT IV VIDEO RETRIEVAL
Content Based Video Retrieval - Video Parsing – Video abstraction and Summarization– Video Content Representation, Indexing and retrieval –Video Browsing Schemes–Example of Video Retrieval Systems

UNIT V RETRIEVAL METRICS AND MODERN IR

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of the course the student can able to
- learn the basics of multimedia information storage technology, techniques for analysis, representation and retrieval that is commonly used in industry.
- compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models.
- outline the structure of queries and media elements.
- critically evaluate Multimedia retrieval system effectiveness and improvement techniques.
- work on recent trends in multimedia retrieval systems

REFERENCES:

XT5091 GAME PROGRAMMING

OBJECTIVES:
- To get subsequent understanding of graphics methods which can be used in game design and development
- To get knowledge in Game design and development
- To get exposure to Rendering tools which is used in hardware and software design
- To learn about recent platforms and frame works used in Gaming
- To learn how develop game for single and Multi player

TOTAL: 45 PERIODS
UNIT I  GRAPHICS FOR GAME PROGRAMMING  9

UNIT II  GAME DESIGN PRINCIPLES  9
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  9
Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics.

UNIT IV  GAMING PLATFORMS AND FRAMEWORKS  9
Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity.

UNIT V  GAME DEVELOPMENT  9
Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.  

TOTAL: 45 PERIODS

OUTCOMES:
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.
• Develop effective mechanism for collision detection.
• Develop game for single and multiple players.

REFERENCES:

XT5092  AUGMENTED REALITY AND VIRTUAL REALITY  L  T  P  C  3  0  0  3

OBJECTIVES:
• To understand the basics of augmented reality.
• To study about how to create various content in augmented reality.
• To understand the elements, architecture, input and output devices of virtual and augmented reality systems.
• To study about interfaces used in virtual reality systems.
• To understand various rendering systems used in virtual world.
UNIT I OVERVIEW OF AUGMENTED REALITY
Augmented Reality – Relationship between augmented reality and other technologies – Augmented reality concepts – major hardware components for augmented reality systems – major software components for augmented reality systems

UNIT II AUGMENTED REALITY CONTENT

UNIT III VIRTUAL REALITY KEY ELEMENTS
Virtual Reality – Key elements of virtual reality – communication through medium – common issues of Human Communication Media – Interface to the Virtual World

UNIT IV VIRTUAL REALITY SYSTEMS
Interface to virtual world – input – user monitoring – world monitoring – interface to virtual world – output – visual displays

UNIT V RENDERING THE VIRTUAL WORLD

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students will be able to:
- Analyze the relationship between augmented reality and other technologies.
- Develop contents for augmented reality applications.
- Develop solutions for human communication media issues.
- Apply monitoring techniques in virtual reality systems.
- Apply rendering techniques in virtual world.

REFERENCES:

XC5078 PATTERN RECOGNITION L T P C 3 0 0 3

OBJECTIVES:
- To learn about Supervised and unsupervised Learning.
- To study about feature extraction and structural pattern recognition.
- To explore different classification models.
- To learn Artificial Intelligence techniques.
- To understand Fuzzy Pattern Classifiers and Perception.
UNIT I  OVERVIEW OF PATTERN RECOGNITION  9
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  9
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  9
KL Transforms – feature selection through functional approximation – Binary selection – Elements of formal grammars, syntactic description, stochastic grammars, Structural representation

UNIT IV  AI TECHNIQUES  9

UNIT V  RECENT ADVANCES AND IMAGE APPLICATIONS  9
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.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the subject, students would have learnt about:
• how to classify data and identifying patterns.
• how to extract feature set and select the features from given data set
• how to apply graph theory approaches to pattern clustering.
• how to apply AI techniques
• how to apply Fuzzy logic and neural pattern rules

REFERENCES :
OBJECTIVES:
- To learn about the building blocks of multimedia
- To learn how multimedia is useful in web
- To study about the methods used to authoring and story boarding
- To get exposure in various compression algorithms
- To get familiar with multimedia applications in recent trends.

UNIT I  MULTIMEDIA BASICS

UNIT II  MULTIMEDIA ON THE WEB

UNIT III  AUTHORING AND TOOLS
Authoring – Story Boarding, Metaphors - Card / Page, Icon, Timeline, Tools – Adobe DreamWeaver CC, Flash, Edge Animate CC, Camatias Studio 8, Claro, E-Learning Authoring Tools –Articulate, Elucidate, Hot Lava.

UNIT IV  DATA COMPRESSION

UNIT V  MULTIMEDIA APPLICATIONS
Multimedia Databases – Content Based Information Retrieval, Multimedia Communications - Multimedia Information Sharing and Retrieval – Applications – Social Media Sharing, Online Social Networking - Virtual Reality - Multimedia for Portable Devices, Collaborative Multimedia Applications

OUTCOMES:
Upon completion of the course, the students will be able to:
- understand working basic elements of multimedia
- explain the importance of web based multimedia usage
- use and apply authoring tools for web and e-learning
- apply the data compression techniques to multimedia data.
- implement various multimedia applications.

REFERENCES:
OBJECTIVES:
- To present the concepts software processes methodologies and quality Standards.
- To understand the models and metrics of software quality and reliability.
- To know the behavior of the testing techniques.
- To design test cases to detect the errors in the software.
- 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 quality and reliability metrics to ensure the performance of the software.
- test the software by applying various testing techniques.
- prepare test planning based on the document.
- know the inputs and deliverables of the testing process.

REFERENCES:

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**OPEN ELECTIVE COURSES (OEC)**

**MA5891 GRAPH THEORY**

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**OBJECTIVES:**
- To introduce graph models and their basic concepts.
- To explain the importance of connectivity and traversability in graphs.
- To provide structural characterization of graphs with matching and perfect matching.
- To give exposure to graph coloring and planar graphs.
- To give a structural understanding of directed graphs.

**UNIT I INTRODUCTION**
Graphs and simple graphs - Graph isomorphism - Incidence and adjacency matrices - subgraphs - Vertex degrees - Paths and connection - Cycles - Trees - Cut edges and bonds - Cut vertices.

**UNIT II GRAPH CONNECTIVITY AND GRAPH TRAVERSIBILITY**
Connectivity - Whitney’s theorems - Blocks - Applications of connectivity - Euler’s tour - Hamilton Cycles - The Chinese Postman Problem - The Traveling Salesman Problem (only a brief introduction to these problems.)

**UNIT III MATCHINGS IN GRAPHS**
Matching - Matchings and covering in bipartite graphs - Perfect matchings - Independent sets.

**UNIT IV GRAPH COLORING AND PLANAR GRAPHS**
Vertex chromatic number - $k$ – critical graphs - Brook’s theorem - Planar graphs - Euler’s formula - Five color theorem.

**UNIT V DIRECTED GRAPHS**
Directed graphs – Strong directed graphs - Tournaments.

**TOTAL : 45 PERIODS**

**OUTCOMES:**
At the end of the course, students will be able to
- Understand the graph models and their utilities and relevant basic concepts.
- Use graph traversability in solving application problems.
- Apply graph matching ideas in various matching related problems.
- Apply graph coloring and planarity ideas in solving graph partitioning and circuit layout problems.
- Apply directed graph ideas in solving real life application problems.
REFERENCES

STATISTICAL METHODS

OBJECTIVES
- To organize and describe the data and hence compute the various descriptive measures
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions
- To expose to the basic principles of experimental design and hence carry out the analysis of variance
- To use non parametric methods on data sets which are not from normally distributed population
- To prepare the students to implement the various concepts in statistics using R statistical tool

UNIT I DESCRIPTIVE STATISTICS
Frequency distribution - Graphs of frequency distribution - Descriptive Measures - Quartiles and Percentiles - Calculation of sample mean and population mean

UNIT II HYPOTHESIS TESTING
Sampling Distributions- Central Limit Theorem - Testing a Statistical Hypothesis - Tests Concerning Means and variances - Independence of Attributes - Goodness of Fit

UNIT III ANALYSIS OF VARIANCES
One way and two way classification - Completely Randomized Design - Randomized Block Design - Latin Square Design

UNIT IV NONPARAMETRIC METHODS
Sign Test - Wilcoxon’s Signed Rank Test - Rank Sum Tests - Tests of Randomness - Kolmogrov Smirnov and Anderson Darling Tests

UNIT V CALCULATIONS USING R

TOTAL: 45 PERIODS

OUTCOMES:
- It equips the student to compute mean, variances, quartiles and percentiles for a large set of data points obtained from a series of measurements
- It imparts the knowledge of various test statistics used in hypothesis testing for mean and variances of large and small samples
- It enables the students to compare several means
- It makes the students use sign test and rank test which can be applied to any raw data without the underlying assumptions that the observations are from normal population.
- It equips the students to implement the various concepts learnt using R tool for statistics
REFERENCES:

AUDIT COURSES (AC)

AX5091 ENGLISH FOR RESEARCH PAPER WRITING

OBJECTIVES:
- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS

UNIT III TITLE WRITING SKILLS
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

OUTCOMES:
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission
REFERENCES:

AX5092 DISASTER MANAGEMENT L T P C 2 0 0 0

OBJECTIVES:
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 9
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS 9

UNIT III DISASTER PRONE AREAS IN INDIA 9
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT 9
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.
UNIT V  RISK ASSESSMENT
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL: 30 PERIODS

OUTCOMES:
CO1: Ability to summarize basics of disaster
CO2: Ability to explain critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

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REFERENCES:

AX5093  SANSKRIT FOR TECHNICAL KNOWLEDGE

OBJECTIVES:
- Illustrate the basic sanskrit language.
- Recognize sanskrit, the scientific language in the world.
- Appraise learning of sanskrit to improve brain functioning.
- Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
- Extract huge knowledge from ancient literature.

UNIT I  ALPHABETS
Alphabets in Sanskrit

UNIT II  TENSES AND SENTENCES
Past/Present/Future Tense - Simple Sentences
UNIT III  ORDER AND ROOTS  6
Order - Introduction of roots

UNIT IV  sanskrit literature  6
Technical information about Sanskrit Literature

UNIT V  TECHNICAL CONCEPTS OF ENGINEERING  6
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL: 30 PERIODS

OUTCOMES:
- CO1 - Understanding basic Sanskrit language.
- CO2 - Write sentences.
- CO3 - Know the order and roots of Sanskrit.
- CO4 - Know about technical information about Sanskrit literature.
- CO5 - Understand the technical concepts of Engineering.

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REFERENCES:
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

AX5094  VALUE EDUCATION  L T P C

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OBJECTIVES
Students will be able to
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT I

UNIT II
UNIT III

UNIT IV

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to
- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the overall personality.

SUGGESTED READING

AX5095
CONSTITUTION OF INDIA

OBJECTIVES
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I
HISTORY OF MAKING OF THE INDIAN CONSTITUTION:
History, Drafting Committee, (Composition & Working)

UNIT II
PHILOSOPHY OF THE INDIAN CONSTITUTION:
Preamble, Salient Features

UNIT III
CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES:

UNIT IV
ORGANS OF GOVERNANCE:
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.
UNIT V LOCAL ADMINISTRATION:

UNIT VI ELECTION COMMISSION:
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:
• Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
• Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
• Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
• Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING
1. The Constitution of India, 1950 (Bare Act), Government Publication.

AX5096 PEDAGOGY STUDIES L T P C

OBJECTIVES
Students will be able to:
• Review existing evidence on there view topic to inform programme design and policy
• Making under taken by the DfID, other agencies and researchers.
• Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.
UNIT III  EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

UNIT IV  PROFESSIONAL DEVELOPMENT
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V  RESEARCH GAPS AND FUTURE DIRECTIONS
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to understand:
• What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
• What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
• How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

SUGGESTED READING

AX5097 STRESS MANAGEMENT BY YOGA

OBJECTIVES
• To achieve overall health of body and mind
• To overcome stress

UNIT I
Definitions of Eight parts of yoga.(Ashtanga)
UNIT II
Yam and Niyam - Do’s and Don’t’s in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

UNIT III
Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:

• Develop healthy mind in a healthy body thus improving social health also
• Improve efficiency

SUGGESTED READING
1. ‘Yogic Asanas for Group Tarining-Part-I”:Janardan Swami Yoga bhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

AX5098

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

OBJECTIVES

• To learn to achieve the highest goal happily
• To become a person with stable mind, pleasing personality and determination
• To awaken wisdom in students

UNIT I
Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (don’t’s) - Verses- 71,73,75,78 (do’s)

UNIT II
Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 - Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to

• Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
• The person who has studied Geeta will lead the nation and man kind to peace and prosperity
• Study of Neet is hatakam will help in developing versatile personality of students.

SUGGESTED READING
1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s Three Satakam, Niti-sringar-vairagya, New Delhi,2010