1.1.3

List of Employability/ Entrepreneurship/ Skill Development Courses with Course Contents

Colour Codes		
Name of the Subjects	Yellow	
Employability Contents	Green	
Entrepreneurship Contents	Light Blue	
Skill Development Contents	Pink	

List of Courses Focus on Employability/ Entrepreneurship/ Skill Development

Department : *Information Technology*

Programme Name : *B.Tech.*

Academic Year : 2023-24

List of Courses Focus on Employability/ Entrepreneurship/Skill Development

Sr. No.	Course Code	Name of the Course
01.	ITUCTT1	DATA STRUCTURE & ALGORITHMS
02.	ITUCTT2	OBJECT ORIENTED PROGRAMMING
03.	ITUCTT3	DIGITAL ELECTRONICS
04.	ITUCTK1	COMPUTER ORGANIZATION & ARCHITECTURE
05.	ITUDTT1	PYTHON FOR DATA SCIENCE
06.	ITUDTT2	OPERATING SYSTEMS
07.	ITUDTK1	DESIGN & ANALYSIS OF ALGORITHMS
08.	ITUDTO1	COMPUTER NETWORK (Not for IT)
09.	IT205TPC01	DATABASE MANAGEMENT SYSTEMS
10.	IT205TPC02	FORMAL LANGUAGE & AUTOMATA THEORY
11.	IT205TPC03	PYTHON PROGRAMMING
12.	IT206TPC01	COMPILER DESIGN
13.	IT206TPC02	COMPUTER NETWORKS
14.	IT206TPE31	GRID & CLOUD COMPUTING
15.	IT206PPE21	MICROPROCESSOR & MICROCONTROLLER LAB
16.	IT206PPE24	IMAGE PROCESSING LAB
17.	IT207TPC01	CYBER SECURITY
18.	IT207TPE42	DATA MINING
19.	IT207TPE51	INTERNET OF THINGS
20.	IT207TOE01	MACHINE LEARNING
21.	IT208TPE63	SOFTWARE TESTING & QUALITY MANAGEMENT
22.	IT208TOE31	WIRELESS SENSOR NETWORK
23.	IT208TOE01	SOFT COMPUTING

Scheme and Syllabus

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
SECOND YEAR, INFORMATION TECHNOLOGY
SEMESTER III
EFFECTIVE FROM SESSION 2023-24 (NEP)

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	ITUCTT1	DATA STRUCTURE & ALGORITHMS	3	0	0	40	60	100	3
2	ITUCTT2	OBJECT ORIENTED PROGRAMMING	3	1	0	40	60	100	4
3	ITUCTT3	DIGITAL ELECTRONICS	3	0	0	40	60	100	3
4	ITUCTE1	MATHEMATICS-III	3	0	0	40	60	100	3
5	ITUCTKX	DEPARTMENT ELECTIVE-I	3	0	0	40	60	100	3
6		INSTITUTE CORE-I	3	0	0	40	60	100	3
PRACTICAL									
1	ITUCLT1	DATA STRUCTURE LAB	0	0	3	25	25	50	1.5
2	ITUCLT2	OBJECT ORIENTED PROGRAMMING WITH C++ LAB	0	0	3	25	25	50	1.5
TOTAL CREDITS									**22**

IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL

LIST OF DEPARTMENT ELECTIVE-I

1	ITUCTK1	COMPUTER ORGANIZATION & ARCHITECTURE
2	ITUCTK2	SOFTWARE ENGINEERING
3.	ITUCTK3	MULTIMEDIA SYSTEM DESIGN

LIST OF INSTITUTE CORE-I

1	ITUCTO1	COMPUTER ORGANIZATION & ARCHITECTURE (Not for IT)
2	CSUCTO1	DATA STRUCTURE WITH C++
3	ECUCTO1	DATA COMMUNICATION
4	CEUCTO1	GREEN BUILDINGS
5	CHUCTO1	ENGINEERING MATERIALS
6	MEUCTO1	INTRODUCTION TO THERMODYNAMICS
7	IPUCTO1	I.C. ENGINE

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
ITUCTK1	3	0	0	3 HOURS	40	60	3

COMPUTER ORGANIZATION & ARCHITECTURE

Course Objectives:

1. Conceptualize the basics of organizational and architectural,
2. Learn about various basic arithmetic operation
3. Learn about various control unit design and Input-output subsystems
4. Understand the basics pipeline.
5. Understand the basics Memory organization and their basic working.

UNIT 1

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

UNIT 2

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT 3

Introduction to x86 architecture. CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

UNIT 4

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

UNIT 5

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Suggested books:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Suggested reference books:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course Outcomes:

After the course the students are expected to be able to

1. Demonstrate computer organization and architecture concepts of a computer system
2. Describe the Computer arithmetic operation algorithm and hardware
3. Understand the basics of hardwired and micro-programmed control of the CPU, Memory, I/O system
4. Describe fundamentals concepts of pipeline and issues
5. Describe the memory hierarchy and related function.

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
ITUCTT1	3	0	0	3 HOURS	40	60	3

DATA STURCTURE & ALGORITHMS

Course Objective

1. To impart the basic concepts of data structures and algorithms and understand concepts about searching and sorting techniques.
2. To understand basic concepts about Linked lists and master the implementation of linked data structures.
3. To understand basic concepts about stacks and queues.
4. To understand basic concepts about Tree.
5. To understand basic concepts about Graph and be familiar with some graph algorithms such as shortest path and minimum spanning tree.

UNIT- I

Introduction: Basic Terminology, Definition of Data Structure, Types of Data Structure, Operation on Data Structure, **Arrays:** Array Definition, Representation of Arrays: Row Major Order, and Column Major Order.

Searching and Sorting: Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Binary Search, Linear Search.

UNIT II

Linked lists: Definition, Representation and Implementation of Singly Linked Lists, Traversing and Searching of Linked List, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly Linked List, Circularly Linked List.

UNIT III

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.,

Queue: Array and linked representation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Deques.

UNIT IV

Trees: Basic Technology , Binary Tree , Binary tree representation , Algebraic Expressions , Complete Binary Tree, Extended Binary Tree, Full Binary Tree, Array and linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Binary search trees (BST), Insertion and deletion in BST, AVL trees, Heap and heap sort.

UNIT V

Graph: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Weighted Graph, Sequential Representations of Graphs, Adjacency Matrices, Adjacency List, Path Matrices, Linked Representations of Graphs, Graph Traversal - DFS, BFS, Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm.

References books:

1. Lipschutz, "Data Structures with C" Schaum's Outline Series, TMH.
2. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd.

3. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education Asia.
4. A. M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd.
5. K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
6. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
7. G A V Pai, "Data Structures and Algorithms", TMH.
8. G.S.Baluja, "Data Structures through C", Dhanpat Rai & Co.
9. Yashavant Kanetkar, "Data Structure Through C", BPB Publication.

Course Outcome

Upon completion of this course, the students will be able to

1. Student will be able to choose appropriate data structure as applied to specified problem definition.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.
5. Students will be able to know about different types of graphs and their applications.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUCTT3	3	0	0	3 HOURS	40	60	3

DIGITAL ELECTRONICS

Course Objectives:

1. To understand the basic knowledge of digital logic and components.
2. To simplify the Boolean expressions or Combinational circuits for compact circuits.
3. Design of combinational circuits and sequential circuits.
4. Application of knowledge to understand digital electronics circuits.
5. To impart how to design Digital Circuits.

UNIT 1 - Fundamentals of Digital systems and logic families

Digital signals, digital circuits, AND,OR, NOT, NAND, NOR and Exclusive OR operations, Boolean algebra, examples of IC gates, number systems- binary, signed binary, octal, Hexadecimal number, binary arithmetic, Once's and two's complements, arithmetic codes, error detecting, and correcting codes, characteristics of digital ICs, digital logic families, TTL, schottky TTL and CMOS logic , interfacing CMOS and TTL, Tri-state logic.

UNIT 2 - Combinational Digital Circuits

Standard representation for logic function, K map representation, simplification of logic functions, using K map, minimization of logical functions. Don't care conditions, Multiplexes, De- Multiplexes, / Decoders, Adders, Sub tractors, BCD arithmetic, carry look ahead, serial adders , ALU , elementary ALU design, popular MSI chips , digital comparator , parity checker, / generator, code converters, priority encoders, decoders/ drivers, for display devices, Q-M method of function realization.

UNIT 3 - Sequential circuits and systems

A 1 bit memory, the circuits properties, of Bi-stable latch, the clocked SR flip flop, JK flip flops, T flip flops, D flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counter's design using flip flops, special counter IC's, Asynchronous sequential counters, applications of counters.

UNIT 4 - A/D and D/A converters

Digital to analog converters: weighted registers/ converters, R-2R Ladder, D/A converters , specifications for D /A converters, examples of D /A converter ICs, sample and hold circuits, Analog to digital converters: quantization and encoding, parallel comparator , A/D converter, successive approximation A/D converter, counting A/D converter, dual slop A / D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

UNIT 5 - Semiconductor memories and Programmable logic devices

Memory organization and operation, expanding memory size, classification and characteristics of memories, Sequential memories, read-only memory(ROM), read and write memory (RAM), content addressable memory (CAM) , charge coupled device memory (CCD) , commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS) , Field Programmable Gate Array (GPGA).

Text / References:

1. M.M Mano, "Digital logic and Computer design", Pearson Education India.
2. R.P. Jain, " Modern Digital Electronics" , McGraw Hill Education.
3. A kumar, "Fundamentals of Digital Circuits ", Prentice Hall India.
4. S Salivahanan and S Arivazhagan " Digital Circuits and Design" OXFORD University Press.

Course Outcome (COs):

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

1. Employ the codes and number systems converting circuits and Compare different types of logic families which are the basic unit of different types of logic gates in the domain of economy, performance and efficiency.
2. Analyze different types of digital electronic circuit using various mapping and logical tools and know the techniques to prepare the most simplified circuit using various mapping and mathematical methods.
3. Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.
4. Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.
5. Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUCTT2	3	1	0	4 HOURS	40	60	4

OBJECT ORIENTED PROGRAMMING

Course Objectives:

1. To understand and Practice Programming Construct: Variable, Operators, Control Structures, Loop, Functions, learn the concept of class and object and develop classes for simple applications with C++.
2. To learn how to implement Constructors, copy constructors and destructor functions.
3. To learn how to overload functions and operators in C++.
4. To learn how to design C++ classes for code reuse and perform inheritance.
5. To learn working with files and handle exceptions in program.

UNIT I

Overview of C++: Object oriented programming, Concepts, Advantages, Usage. C++ Environment: Program development environment, the language and the C++ language standards. Introduction to various C++ compilers, C++ standard libraries, Prototype of main() function, Data types. C++ as a superset of C, New style comments, main function in C++, meaning of empty argument list, function prototyping, default arguments and argument matching.

User defined data types: enumerated types, use of tag names, anonymous unions, scope of tag names Classes & Objects : Classes, Structure & Classes, Inline Function, Scope Resolution operator, Static Class Members: Static Data Member, Static Member Function, Passing Objects to Function, Returning Objects, Object Assignment. Friend Function, Friend Classes

UNIT II

Array, Pointers References & The Dynamic Allocation Operators: Array of Objects, Pointers to Object, Type Checking C++ Pointers, The This Pointer, Pointer to Derived Types, Pointer to Class Members, References: Reference Parameter, call by reference and return by reference Passing References to Objects, Returning Reference, Independent Reference, C++'S Dynamic Allocation Operators, Initializing Allocated Memory, Allocating Array, Allocating Objects.

Constructor & Destructor: Introduction, Constructor, access specifies for constructors, and instantiation, Parameterized Constructor, Multiple Constructor in A Class, Constructor with Default Argument, Copy Constructor, Destructor.

UNIT III

Overloading as polymorphism: Function & Operator Overloading : Function Overloading, Overloading Constructor Function Finding the Address of an Overloaded Function, Operator Overloading: Creating A Member Operator Function, Creating Prefix & Postfix Forms of the Increment & Decrement Operation, Overloading The Shorthand Operation (i.e., +=, -= etc), Operator Overloading Restrictions, Operator Overloading Using Friend Function, Overloading Some Special Operators like [ ], ( ), -, Comma Operator, Overloading << etc.

UNIT IV

Inheritance : Base Class Access Control, Inheritance & Protected Members, Protected Base Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors & Inheritance, When Constructor & Destructor Function are Executed, Passing Parameters to Base Class Constructors, Granting Access, Virtual Base Classes .

Virtual Functions & Polymorphism: Virtual Function, Pure Virtual Functions, Early Vs. Late Binding.

UNIT V

Working with files: File & stream, Opening and closing a file, read ( ) and write ( ) functions, detecting end of file.

Templates and Exception Handling: Exception handling in C++, try, throw, catch sequence, multiple catch blocks, uncaught exceptions, catch-all exception handler

Reference Books:

1. Object Oriented Programming with C++ by M. P. Bhave, S. A. Patekar, Pearson Education
2. Object Oriented Programming With C++ by E. Balaguruswamy.
3. Object Oriented Programming in turbo C++ by Robert Lafore.
4. Programming with C++ by D. Ravichandan.
5. Programming with C++ (SOS) by Hubbard.

Course Outcomes:-

1. Understand the C++ language features. Use the control structure and data types in C++. Write simple programs using classes and objects.
2. Understand the concepts of arrays, pointers, references and use of dynamic allocation operators. Write simple programs to implement Constructor & destructor concepts.
3. Understand the concept of Operator overloading and type conversion.
4. Understand the concepts of inheritance and virtual functions.
5. Understand file handling concepts, generic class and I/O exception handling.

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
SECOND YEAR, INFORMATION TECHNOLOGY
SEMESTER IV
EFFECTIVE FROM SESSION 2023-24 (NEP)

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	ITUDTT1	PYTHON FOR DATA SCIENCE	3	1	0	40	60	100	4
2	ITUDTT2	OPERATING SYSTEMS	3	0	0	40	60	100	3
3	ITUDTT3	DISCRETE MATHEMATICS	3	0	0	40	60	100	3
4	ITUDTKX	DEPARTMENT ELECTIVE-II	3	0	0	40	60	100	3
5		INSTITUTE CORE-II	3	0	0	40	60	100	3
PRACTICAL									
1	ITUDLT1	PYTHON FOR DATA SCIENCE LAB	0	0	3	25	25	50	1.5
2	ITUDLT2	OPERATING SYSTEMS LAB	0	0	3	25	25	50	1.5
3	ITUDPV1	MINI PROJECT	0	0	4	50	50	100	2
TOTAL CREDITS									**21**
IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL									

LIST OF DEPARTMENT ELECTIVE-II

1	ITUDTK1	DESIGN & ANALYSIS OF ALGORITHMS
2	ITUDTK2	DIGITAL SIGNAL PROCESSING
3	ITUDTK3	COMPUTER APPLICATION IN SOCIAL SCIENCES

LIST OF INSTITUTE CORE-II

1	ITUDTO1	COMPUTER NETWORK (Not for IT)
2	ITUDTO2	FUNDAMENTALS OF PYTHON PROGRAMMING (Not for IT)
3	CSUDTO1	INTRODUCTION TO INFORMATION SCIENCE
4	ECUDTO1	ELECTRONICS DEVICES AND CIRCUITS
5	CEUDTO1	REMOTE SENSING & GIS
6	CHUDTO1	ENERGY AND ENVIRONMENT ENGINEERING
7	ESUDTO1	EFFECTIVE TECHNICAL COMMUNICATION
8	MEUDTO1	INTRODUCTION TO FLUID MECHANICS
9	IPUDTO1	AUTOMOBILE ENGINEERING

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
ITUDTK1	3	0	0	3 HOURS	40	60	3

DESIGN & ANALYSIS OF ALGORITHMS

Course Objectives

1. To develop proficiency in problem solving and programming.
2. To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.
3. To get a good understanding of applications of Data Structures.
4. To develop a base for advanced study in Computer Science.
5. To teach various advanced design and analysis techniques such as greedy algorithms, dynamic programming & Know the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems.

Unit 1:

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Unit 2:

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branchand-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

Unit 3:

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

Unit 4:

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Unit 5:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

Suggested books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.

2. Fundamentals of Algorithms – E. Horowitz et al.

Suggested reference books

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

Course Outcomes

1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms.

2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming.
5. To understand an analyses approximation algorithms, Randomized algorithms, NP and P SPACE.

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
ITUDTO1	3	0	0	3 HOURS	40	60	3

COMPUTER NETWORK (Not for IT)

Course Objective

1. Discuss the basic taxonomy and terminology of the computer networking.
2. Discuss the functionality of different layers of OSI Model.
3. Discuss different protocols of TCP/IP protocol suite.
4. Discuss the process of IP addressing and working of routing protocols.
5. Discuss the different challenges of Internetworking, Congestion control and Quality of services.

Unit No.	Syllabus Content	No. of Hours
1	**Introduction:** **Data communications:** Components, Data representation, Direction of data flow (simplex, half duplex, full duplex). **Networks:** Distributed processing, Network criteria, Physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, internet today, Protocols and standard. **Reference models:** OSI reference model, TCP/IP reference model, their comparative study. **Physical Layer:** Transmission technology.	10
2	**Data Link Layer:** Types of errors, Error detection & correction methods, Framing (character and bit stuffing), Flow control, Protocols: Stop & wait ARQ Go – Back – N ARQ, Selective repeat ARQ **Medium access sub layer:** Point to point protocol, Multiple Access Protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Token ring, Reservation, Polling, FDMA, TDMA, CDMA.	10
3	**Network Layer:** **Internetworking devices**: Repeaters, Hubs, Bridges, Switches, Router, Gateway. **Addressing**: IP addressing, classful addressing, subnetting. **Routing**: Techniques, Static vs. Dynamic routing, Routing table for classful address, Flooding, Shortest path algorithm, Distance vector routing, Link state routing. **Protocols:** ARP, RARP, IP, ICMP, IPV6.	10
4	**Transport Layer:** Process to process delivery, UDP: Services and applications, TCP: Stream Oriented Service, Segment, Timers, Congestion control techniques: Avoidance and Detection.	8
5	**Application Layer:** DNS, SMTP, FTP, HTTP & WWW. **Security:** Cryptography, User authentication, Security protocols in internet, Firewalls. Recent research topic on networking.	7

Text Books:

1. Data Communications and Networking by B.A.Forouzan – TMH Publication.
2. Computer Networks by S. Tanenbaum – Pearson Education / PHI Publication.

Reference Books:

1. Internetworking with TCP/IP by Comer - Pearson Education/PHI by Publication.
2. Data and Computer Communications by W.Stallings – PHI Publication.

Course Outcome

1. Upon completion of this course, the students will be able to
2. Understand the working of different internetworking devices.
3. Understand the working of Internet.
4. Understand the difference between OSI and TCP/IP.
5. Understand the security mechanism in Networking.
6. Understand core concept of IP addressing and routing.

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
ITUDTT2	3	0	0	3 HOURS	40	60	3

OPERATING SYSTEMS

Objectives of the course

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication.
3. To learn the mechanisms involved in memory management in contemporary OS.
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
5. To know the components and management aspects of concurrency management.

UNIT I - INTRODUCTION TO OPERATING SYSTEM:

Objective and function of operating system. The evaluation of the operating system, system components operating system services, system structure, batch interactive, time sharing and real time operating system, Protection. File system: File concepts, file organization and access mechanism.

UNIT II - CONCURRENT PROCESS:

Process concepts, principal of concurrency. The producer consumer problem, the critical section problem, semaphore, classical problem in concurrency , inter process communication , process generation, process scheduling.

UNIT III - CPU SCHEDULING:

Scheduling concepts, performance criteria scheduling algorithms. Algorithm evaluation, multiprocessor scheduling. I/O management and Disk scheduling I/O devices and organization of the I/O functions. I/O buffering disk I/O operating system design issues.

UNIT IV - DEAD LOCKS:

System models, deadlock characterization, prevention, avoidance and detection recovery from deadlock, combined approach.

UNIT V - MEMORY MANAGEMENT:

Base machine , Residence monitor , multiprogramming with fixed partition , multiprogramming with variable partitions, multiple base register, paging, segmentation, paging segmentation, virtual memory concepts , demand paging performance , page replacement algorithms, allocation of frames, thrashing, cache memory organization impact on performance.

Reference Books

1. Milenkovic M. , "Operating System concepts", MGH
2. Tanenbaubm A. S. "Operating System design and implementation" , PHI
3. Silberschartz A.and Patterson J.I. , " Operating system concepts", Wisley.
4. Stilling William " Operating System ", Maxwell McMillan International Edition 1992.
5. Dectel H.N. , "An introduction to operating system ", Addision Wisley.

Course Outcomes

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, and Response Time.
3. Specification of memory organization develops the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.
5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
ITUDTT1	3	1	0	4 HOURS	40	60	4

PYTHON FOR DATA SCIENCE

Course Objectives:

1. To read and write simple Python programs.
2. To develop Python programs with conditions, loops and functions.
3. To create and work with files in python.
4. To develop OOP programs in python.
5. To create and work on Numpy arrays.
6. To handle data in python using pandas.

UNIT 1: INTRODUCTION TO DATA SCIENCE AND PYTHON PROGRAMMING

Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators.

Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.

UNIT 2: FILE, EXCEPTION HANDLING AND OOP

User defined Modules and Packages in Python- Files: File manipulations, File and Directory related methods- Python Exception Handling.

OOPs Concepts -Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance.

UNIT 3: INTRODUCTION TO NUMPY

NumPy Basics: Arrays and Vectorized Computation - The NumPy nd array- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing- Transposing Arrays and Swapping Axes.

Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods - Sorting-Unique and Other Set Logic.

UNIT 4: DATA MANIPULATION WITH PANDAS

Introduction to pandas Data Structures: Series, Data Frame, Essential Functionality: Dropping Entries- Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.

UNIT 5: DATA CLEANING, PREPARATION AND VISUALIZATION

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas.

Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

TEXT BOOKS

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython",O'Reilly, 2nd Edition,2018.
3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly,2017.

4. Miller, Bradley, and David Ranum. Problem Solving with Algorithms and Data Structures Using Python. 2nd ed. Franklin, Beedle & Associates, 2011. ISBN: 9781590282571.

REFERENCES BOOKS

1. Wesley J. Chun, "Core Python Programming", Prentice Hall,2006.
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009.

E BOOKS

1. https://www.programmer-books.com/introducing-data-science-pdf/
2. https://www.cs.uky.edu/~keen/115/Haltermanpythonbook.pdf
3. http://math.ecnu.edu.cn/~lfzhou/seminar/[Joel_Grus]_Data_Science_from_Scratch_First_Princ.pdf

MOOC

1. https://www.edx.org/course/python-basics-for-data-science
2. https://www.edx.org/course/analyzing-data-with-python
3. https://www.coursera.org/learn/python-plotting?specialization=data-science-python

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Introduce students to Python's history, installation, and basic usage, enabling them to write and execute simple Python programs.
2. Familiarize students with Python syntax, data types, variables, and fundamental operators to build a solid programming foundation.
3. Teach students how to make decisions and control program flow using conditional statements and loops in Python.
4. Equip students with essential skills for file handling, and exception handling, and introduce them to modules and libraries in Python for more advanced programming tasks.
5. Teach students data structures and data manipulation techniques for data analysis
6. Familiarize students for data preparation and visualization tasks

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, INFORMATION TECHNOLOGY
SEMESTER V
EFFECTIVE FROM SESSION 2022-23

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	IT205TES07	SIGNALS & SYSTEMS	3	0	0	30	70	100	3
2	IT205TPC01	DATABASE MANAGEMENT SYSTEMS	3	0	0	30	70	100	3
3	IT205TPC02	FORMAL LANGUAGE & AUTOMATA THEORY	3	0	0	30	70	100	3
4	IT205TPC03	PYTHON PROGRAMMING	3	1	0	30	70	100	4
5	IT205TPE1X	ELECTIVE – I	3	0	0	30	70	100	3
PRACTICAL									
1	IT205PPC01	DATABASE MANAGEMENT SYSTEMS LAB	0	0	4	30	20	50	2
2	IT205PPC02	PYTHON PROGRAMMING LAB	0	0	4	30	20	50	2
3	IT205PMC01	CONSTITUTION OF INDIA/ ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	-	-	2	-	-	-	0
TOTAL CREDITS									**20**
IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL									

LIST OF ELECTIVE-I

1	IT205TPE11	SOFTWARE ENGINEERING
2	IT205TPE12	REAL TIME SYSTEM
3.	IT205TPE13	CYBER LAW & ETHICS
4.	IT205TPE14	EMBEDDED SYSTEMS

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT205TPC01	3	0	0	3 HOURS	30	70	3

Database Management Systems

Course Objectives:

1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Unit 1: Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit 2: Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit 3: Storage strategies: Indices, B-trees, hashing. Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit 4: Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Unit 5: Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Suggested books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Suggested reference books

1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
2. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
3. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

Course Outcomes:

1. Gain knowledge of fundamentals of DBMS, database design and normal forms.
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT205TPC02	3	0	0	3 HOURS	30	70	3

Formal Language & Automata Theory

Course Objectives:

1. Understand basic properties of formal languages and formal grammars.
2. Design and Understand basic properties of deterministic and nondeterministic finite automata
3. Design and Understand basic properties of pushdown automata.
4. Understand the relation between types of languages and types of finite automata
5. Design and Understanding the Context free languages and grammars, and also Normalising CFG.
6. Understanding the minimization of deterministic and nondeterministic finite automata.
7. Design and Understand basic properties of Turing machines and computing with Turing machines.
8. Design and Understand the concept of Mealy and Moore automata and its application.
9. Know the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem.
10. Understand the challenges for Theoretical Computer Science.

Unit-I Automata: Basic machine, FSM , Transition graph, Transition matrix, Deterministic and nondeterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-way finite automata. Regular Sets and Regular Grammars: Alphabet, words, Operations, Regular sets, Finite automata and regular expression, MyhillNerode theorem Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

Unit-II Context –Free Grammars: Introduction to CFG, Regular Grammars, Derivation trees and Ambiguity, Simplification of Context free grammars, Normal Forms (Chomsky Normal Form and Greibach Normal forms).

Unit-III Pushdown Automata: Definition of PDA, Deterministic Pushdown Automata, PDA corresponding to given CFG, CFG corresponding to a given PDA. Context Free Languages: The pumping lemma for CFL's, Closure properties of CFL's, Decision problems involving CFL's.

Unit-IV Turing Machines: Introduction, TM model, representation and languages acceptability of TM Design of TM,Universal TM & Other modification, Church's hypothesis, composite & iterated TM. Turing machine as enumerators.Properties of recursive & recursively enumerable languages,Universal Turing machine

Unit V Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, examples of these problems like satisfy ability problems, vertex cover problem, Hamiltonian path problem, traveling sales man problem, Partition problem etc.

Suggested books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Suggested reference books:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Course Outcomes :

1. Comprehend Knowledge to acquire a full understanding of Automata Theory as the basis of all computer science languages - Model building and have a clear understanding of the Automata theory concepts.
2. Cognitive skills - Be able to design FAs, NFAs, Grammars, languages modeling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
3. Professional Skill - Perceive the power and limitation of a computer as a computing machine.
4. Attitude - Develop a perception on the importance of computational theory as model building.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT205TPC03	3	1	0	4 HOURS	30	70	4

Python Programming

Course Objectives:

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

UNIT - I Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules Sequences - Strings, Lists, and Tuples, Mapping and Set Types.

UNIT - II FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

UNIT - III Regular Expressions: Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules.

UNIT - IV GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application Advanced CGI, Web (HTTP) Servers.

UNIT - V Database Programming: Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules.

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCES BOOKS:

1. Think Python, Allen Downey, Green Tea Press.
2. Introduction to Python, Kenneth A. Lambert, Cengage.

3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
4. Learning Python, Mark Lutz, O'Really.

Course Outcomes:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, INFORMATION TECHNOLOGY
SEMESTER VI
EFFECTIVE FROM SESSION 2022-23

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	IT206TPC01	COMPILER DESIGN	3	0	0	30	70	100	3
2	IT206TPC02	COMPUTER NETWORKS	3	0	0	30	70	100	3
3	IT206TPE2X	ELECTIVE – II	3	0	0	30	70	100	3
4	IT206TPE3X	ELECTIVE – III	3	0	0	30	70	100	3
5		OPEN ELECTIVE - I	3	0	0	30	70	100	3
PRACTICAL									
1	IT206PPC01	COMPUTER NETWORKS LAB	0	0	4	30	20	50	2
2	IT206PPE2X	ELECTIVE – II LAB	0	0	4	30	20	50	2
3	IT206PPR11	PROJECT - I	0	0	6	30	20	50	3
TOTAL CREDITS									**22**
IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL									

LIST OF ELECTIVE – II

1.	IT206TPE21	MICROPROCESSOR & MICROCONTROLLER
2.	IT206TPE22	WEB TECHNOLOGY & E-COMMERCE
3.	IT206TPE23	QUEUING THEORY & MODELING
4.	IT206TPE24	IMAGE PROCESSING

LIST OF ELECTIVE – II (LAB)

1.	IT206PPE21	MICROPROCESSOR & MICROCONTROLLER LAB
2.	IT206PPE22	WEB TECHNOLOGY & E-COMMERCE LAB
3.	IT206PPE23	QUEUING THEORY & MODELING LAB
4.	IT206PPE24	IMAGE PROCESSING LAB

LIST OF ELECTIVE-III

1.	IT206TPE31	GRID & CLOUD COMPUTING
2.	IT206TPE32	MULTIMEDIA SYSTEM DESIGN
3.	IT206TPE33	SPEECH & NATURAL LANGUAGE PROCESSING
4.	IT206TPE34	GRAPH THEORY

LIST OF OPEN ELECTIVE-I

S.No.	COURSE CODE	COURSE NAME	OFFERED BY	ELIGIBLE DEPARTMENT
1.	CH206TOE01	INDUSTRIAL UTILITIES AND SAFETY	CHEMICAL	CIVIL, CSE, ECE, IPE, IT & MECH
2.	CE206TOE01	METRO SYSTEMS AND ENGINEERING	CIVIL	CHEM, CSE, ECE, IPE, IT & MECH
3.	CS206TOE01	OBJECT ORIENTED PROGRAMMING WITH C++	CSE	CHEM, CIVIL, ECE, IPE, IT & MECH
4.	EC206TOE01	INTRODUCTION TO ELECTRONIC DEVICES AND CIRCUITS	ECE	CHEM, CIVIL, CSE, IPE, IT & MECH
5.	IP206TOE01	OPERATION RESEARCH	IPE	CHEM, CIVIL, CSE, ECE, IT & MECH
6.	IT206TOE01	COMPUTER GRAPHICS	IT	CHEM, CIVIL, CSE, ECE, IPE & MECH
7.	ME206TOE01	AUTOMOBILE ENGINEERING	MECHANICAL	CHEM, CIVIL, CSE, ECE, IPE & IT

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT206TPC01	3	0	0	3 HOURS	30	70	3

Complier Design

Course Objectives:

1. To learn the process of translating a modern high-level language to executable code.
2. To provide a student with an understanding of the fundamental principles in compiler design and to provide the skills needed for building compilers for various situations that one may encounter in a career in Computer Science.
3. To develop an awareness of the function and complexity of modern compilers.
4. To apply the code generation algorithms to get the machine code for the optimized code.
5. To represent the target code in any one of the code formats.
6. To understand the machine dependent code.
7. To draw the flow graph for the intermediate codes.
8. To apply the optimization techniques to have a better code for code generation.

UNIT 1: Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

UNIT 2: Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) gram-mars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

UNIT 3: Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

UNIT 4: Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT 5: Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

List of Books:

1. A.V.Aho, Ravi Sethi, J.D.Ullman, Compilers tools and Techniques, Addison Wesley.
2. D.M.Dhamdhere, Compiler Construction-Principles and practice Macmillan, India.

3. Tremblay J.P. and Sorenson, P.G. the theory and practice of compiler writing, Mc Graw Hil.
4. Waite W.N. and Goos G., Compiler construction' springer verlag.

Course Outcomes :

By the end of the course, the successful student will be able to do:

1. To realize basics of compiler design and apply for real time applications.
2. To introduce different translation languages.
3. To understand the importance of code optimization.
4. To know about compiler generation tools and techniques.
5. To learn working of compiler and non compiler applications.
6. Design a compiler for a simple programming language.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT206TPC02	3	0	0	3 HOURS	30	70	3

Computer Networks

Course Objectives:

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

UNIT I - Introduction: OSI and TCP/IP Reference models, Function of layers, Network Topologies, Categories of Network - LAN, WAN, MAN, Line Configuration, Transmission Modes, Networking Devices.

UNIT II - Data link layer: Design issues, framing, error detection and correction, CRC, Hamming Code Method, Elementary Protocol- stop and wait, Sliding Window, HDLC, Ethernet, CSMA/CD.

UNIT III - Network Layer: Design Issues, Forwarding and Routing, Virtual Circuit and Datagram Networks, shortest path routing – Dijkstra's algorithms, Link State Routing, Distance Vector Routing, Internet Protocol (IP), Hierarchical Routing – RIP – OSPF – BGP.

UNIT IV - Transport Layer: Transport Layer Services, Transmission Control Protocol, TCP header, 3 way Handshake, UDP, UDP header, Difference between TCP and UDP, Reliable Data Transfer – Go Back N and Selective Repeat.

UNIT V - Application Layer: Principles of Network Applications, Encryption, Compression, Cryptography: Substitution and Transposition Ciphers, Data functions: translation, Encryption standards (DES), RSA, Email, World Wide Web, file transfer protocol, VoIP, TFTP.

TEXT BOOKS

1. Data Communications and Networking – Behrouz A. Forouzan. TMH.
2. Computer Networks — Andrew S Tanenbaum, Pearson Education/PHI.
3. Data and Computer Communication by William Stalling (Pearson Education).

REFERENCE BOOKS

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.
3. Computer Networking by Ed Tittel (Schaum's series) (TMH).
4. Comer, "Computer Networks and Internets with Internet Applications", Pearson Education.

Course Outcomes :

1. Understand fundamental underlying principles of computer networking
2. Understand details and functionality of layered network architecture.
3. Apply mathematical foundations to solve computational problems in computer networking.
4. Analyze performance of various communication protocols.
5. Compare routing algorithms.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT206TPE31	3	0	0	3 HOURS	30	70	3

Grid and Cloud Computing

Course Objectives:

1. Identify the technical foundations of cloud systems architectures.
2. Analyze the problems and solutions to cloud application problems.
3. Apply principles of best practice in cloud application design and management.
4. Identify and define technical challenges for cloud applications and assess their importance.

UNIT I

Cloud Computing, Cloud Architecture, Cloud Storage, Advantages and Disadvantages of Cloud Computing, Companies inthe Cloud Today, Cloud Services, Web-Based Application.Ubiquitous computing, On-Demand Computing,Cloud Computing for theCommunity, Collaborating on Group Projects and Events, Cloud Computing for the Corporation.

UNIT II

Infrastructure as a Service: Introduction, Virtualization, Client and Server, Storage, RAID, IBM SAN, Infrastructure creation, Elastic Computing: Amazon Ec2, Computation Services, Case Study.

UNIT III

Platformas a Service: Microsoft AZURE, Google App Engine, Amazon Web Services, IBM Clouds, Software as a Service, IBM Websphere Cast Iron, Case studies.

UNIT IV

MapReduce, GFS, Hadoop, HDFS,Bigdata, business perspectives, IBM InfosphereBiginsight, Analytics of BigData, Infosphere Streams,

UNIT V

Grid Computing: History, Definition, Types, Architecture and GoalsApplications and Challenges of Grid Computing, Providers of Grid Computing. IBM Globus Toolkit, Grid Security Infrastructure, Open Grid Service Architecture.

TEXT BOOKS / REFERENCE BOOKS

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work andCollaborate Online, Que Publishing, August 2008.
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing.
3. Viktors Berstis , Grid Computing : IBM Red Book.
4. Understanding Bigdata, by Paul C. Zikopoulos et al. McGraw Hill.

5. "Introduction to Grid Computing with Globus", Luis Ferreira et al. IBM Red Books.

Course Outcomes :

1. Understand the fundamental principles of distributed computing.
2. Understand how the distributed computing environments known as Grids can be built from lower level services.
3. Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.
4. Analyze the performance of Cloud Computing.
5. Understand the concept of Cloud Security.
6. Learn the Concept of Cloud Infrastructure Model.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT206TPE24	3	0	0	3 HOURS	30	70	3

Image processing

Course Objectives:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques.
3. To study image restoration procedures.
4. To study the image compression procedures.

Unit 1 Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

Unit 2 Image Enhancements and Filtering-Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Unit 3 Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Unit 4 Image Segmentation- Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Unit 5 Image Compression-Redundancy–inter-pixel and psycho-visual; Lossless compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Text/Reference Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.
3. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015.

Course Outcomes :

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT206TPE24	3	0	0	3 HOURS	30	70	3

Image processing

Course Objectives:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques.
3. To study image restoration procedures.
4. To study the image compression procedures.

Unit 1 Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

Unit 2 Image Enhancements and Filtering-Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Unit 3 Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Unit 4 Image Segmentation- Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Unit 5 Image Compression-Redundancy–inter-pixel and psycho-visual; Lossless compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Text/Reference Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.
3. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015.

Course Outcomes :

1. Review the fundamental concepts of a digital image processing system.
2. Analyze images in the frequency domain using various transforms.
3. Evaluate the techniques for image enhancement and image restoration.
4. Categorize various compression techniques.
5. Interpret Image compression standards.
6. Interpret image segmentation and representation techniques.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT206TPE21	3	0	0	3 HOURS	30	70	3

Microprocessor &Microcontroller

Course Objectives:

Students will be able to.

1. Outline the history of computing devices.
2. Describe the architecture of 8086 Microprocessors.
3. Understand 8051 microcontroller concepts, architecture and programming.
4. Compare microprocessors and microcontrollers.
5. Develop programs for microprocessor and microcontrollers.

UNIT 1: Architecture of Microprocessors

Architecture of 8085Microprocessor.Architecture of 8086 Microprocessor. Signals and pins of 8086 microprocessor.

UNIT 2: Assembly Language of 8086

Description of Instructions, Assembly Directives Assembly, Software Programs with Algorithms

UNIT 3: Interfacing with 8086

Interfacing with RAMs, ROMs along with the explanation of timing diagrams.Interfacing with Peripheral ICs like 8255, 8254, 8279, 8259 etc.Architecture of 8087, Interfacing with 8086.

UNIT 4: Architecture of Micro controllers

Architecture of Microcontroller, Family members, Microcontroller Resources, Architecture of 8051 Microcontroller, Internal External memories, Counters &Timers, Synchronous Serial-Cum-Asynchronous Serial Communication USART Interface in Intel 8051, interrupts.

UNIT 5: Assembly language of 8051

Basic Assembly Language Programming in 8051, 8051 family Microcontrollers Instruction set.

REFERENCES

1. Advanced Microprocessor and peripherals by K M Bhurchandi and A K Ray, McGraw Hill Education (India).
2. Architecture programming, interfacing and system design by Raj Kamal,pearson education.

Course Outcomes :

At the end of the course, students will develop ability to

1. Define the history of microprocessors.
2. Describe the architectures of 8085 and 8086 microprocessors.
3. Write programs for 8086 and 8051.
4. Distinguish between the different modules of operation of microprocessors.
5. Interface peripherals to 8086 and 8051.
6. Evaluate the appropriateness of a memory expansion interface based on the address reference with particular application.
7. Apply the above concepts to real world automation and other electronics problems and applications.

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, INFORMATION TECHNOLOGY
SEMESTER VII
EFFECTIVE FROM SESSION 2023-24

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1.	IT207TPC01	CYBER SECURITY	3	0	0	30	70	100	3
2.	IT207TPE4X	ELECTIVE – IV	3	0	0	30	70	100	3
3.	IT207TPE5X	ELECTIVE – V	3	0	0	30	70	100	3
4.	IT207TOE2X	OPEN ELECTIVE – II	3	0	0	30	70	100	3
PRACTICAL									
1.	IT207PPC21	PROJECT-II	0	0	12	60	40	100	6
TOTAL CREDITS									**18**
IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL									

LIST OF ELECTIVE-IV

1.	IT207TPE41	ADVANCE DATABASE DESIGN
2.	IT207TPE42	DATA MINING
3.	IT207TPE43	GAME THEORY
4.	IT207TPE44	GLOBAL STRATEGY AND TECHNOLOGY

LIST OF ELECTIVE-V

1.	IT207TPE51	INTERNET OF THINGS
2.	IT207TPE52	ADVANCE OPERATING SYSTEM
3.	IT207TPE53	COMPUTER VISION
4.	IT207TPE54	OPEN SOURCE SYSTEM & PROGRAMMING

LIST OF OPEN ELECTIVE-II

1.	IT207TOE01	MACHINE LEARNING
2.	CS207TOE01	GIS & REMOTE SENSING
3.	EC207TOE02	CMOS DIGITAL VLSI DESIGN
4.	CE207TOE02A	GREEN BUILDING AND SUSTAINABLE MATERIALS
5.	ME207TOE02	PRINCIPAL OF MANAGEMENT
6.	CH207TOE02	WASTE TO ENERGY
7.	IP207TOE21	MANUFACTURING PROCESS-I
8.	IP207TOE31	PRODUCTION PLANNING AND CONTROL

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT207TPC01	3	0	0	3 HOURS	30	70	3

CYBER SECURITY

Course Objectives:

1. Identify the technical foundations of Cyber security.
2. Apply principles of cryptography for design of block ciphers.
3. Analyze the principles of public – Key Cryptosystemsand applications.
4. Explore the importance of Cyber Security and Secure financial transactions.
5. Explore the concepts of Firewall, and intrusion detection.

UNIT I

A Model for Network Security Services, Mechanisms, and Attacks, Viruses & Worms, The OSI Security Architecture, symmetric cipher model, substitution techniques Transposition techniques, Steganography.

UNIT II

Block ciphers and the data encryption standard , simplified DES , Block cipher principles , The data Encryption Standard , Differential and Linear Cryptanalysis, Block Cipher Design principles , The AES cipher , Triple DES , blowfish , RC5, Rc4 Stream Cipher

UNIT III

principles of public –Key Cryptosystems , public –Key cryptosystems , Requirements for public –Key Cryptosystems, The RSA Algorithm , Key management , key Distribution ,Hash Functions SHA, MD5. Diffie-Hellman Key Exchange Algorithm

UNIT IV

WEB & IP Security: Web Security Threats, SSL Architecture, SSL Record Protocol, Alert Protocol, Handshake Protocol, Transport Layer Security, Secure Electronic Transaction, IP Security

UNIT V

Intruders: Intrusion Techniques, Firewall Design principles, Block Chain Technology, BitCoin, Types of Firewalls.

List of Books:

1. Cryptography and Network Security, Principles and Practice Third edition , William Stallings .
2. Atul Kahate, " Cryptography and Network Security," TMH
3. Introduction to network security, Krawetz, Cengage

Course Outcomes :

1. Understand the fundamental network security mechanism and threats.
2. Understand the concept of Block cipher and cryptanalyis .
3. Learn the Concept of Public key cryptography systems.
4. Understand the concept of Web security and secure electronic transaction.
5. Understand the Firewall design principles and Block-chain technology .

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT207TPE42	3	0	0	3 HOURS	30	70	3

DATA MINING

Course Objectives:

1. To introduce the concepts and principles of data warehousing, including multidimensional data models, OLAP operations, and data warehousing architecture.
2. To familiarize students with data mining and its related areas, including KDD, DBMS, and DM techniques, and the issues and challenges involved in data mining.
3. To enable students to understand association rules and the various methods to discover them, including the apriori algorithm and hierarchical association rules.
4. To introduce clustering techniques and their applications, including partitioning algorithms, hierarchical clustering, and categorical clustering algorithms.
5. To equip students with the knowledge and skills to design and develop decision trees and understand their construction principles, including the CART, ID3, and C4.5 algorithms.

UNIT I

Data ware Housing: What is a data warehouse?, definition, Multidimensional data model, OLAP operation, warehouse schema, data ware housing architecture, warehouse serve, metadata, OLAP, engine, Data warehousing backend process, other features.

Data Mining: what is data mining? KDD Vs. data mining, DBMS Vs DM other related areas, DM techniques, other mining problem, issues & challenges in DM, Dm application areas.

UNIT II

Association rules: Methods to discover association rules, apriori algorithm ,partition algorithm, pincer –search algorithm, Dynamic Item set counting algorithm, FP-tree Growth algorithm, Incremental algorithm, Border algorithm, hierarchical association rule, generalized association rules, Association rules with item constraints.

UNIT III

Clustering Techniques: Introduction, clustering paradigms, partitioning algorithms, k-Medoid Algorithm, CLARA, CLARANS, Hierarchical clustering, DBSCAN, BIRCH, CURE, Categorical clustering algorithms , STIRR, ROCK , CACTUS.

UNIT IV

Decision trees: Tree construction principal, Best spilt splitting indices, splitting criteria, Decision tree construction algorithm, CART, ID3, C4.5, CHAID, Decision tree construction with pre-sorting, rainforest, approximate method, CLOUDS, BOAT, pruning technique, integration of pruning & construction, Hierarchcal associtation rule.

UNIT V

Web Mining: Web mining ,web content mining ,web structure mining ,web usage mining ,text mining , unstructured text , Episode rule discovery for texts , Hierarchy of categories , text clustering , Paging algorithm.

List of Books:

1. Data Mining techniques – Arun K Pujari Universities press
2. Data Mining concepts & techniques – Jiawei han, Micheline kamber Morgan Kaufmann publisher Elsevier India –2001

3. Data Mining methods for knowledge Discovery –Cios, Pedrycz, swiniarski Kluwer academic publishers London –1998

Course Outcome:

1. Students will be able to understand the fundamental concepts and principles of data warehousing and its architecture, including OLAP and metadata.
2. Students will be able to understand data mining and its related areas, including KDD and DBMS, and apply DM techniques to real-world problems.
3. Students will be able to discover association rules and understand the methods used to discover them, including the apriori algorithm and hierarchical association rules.
4. Students will be able to apply clustering techniques to group similar data and understand partitioning algorithms, hierarchical clustering, and categorical clustering algorithms.
5. Students will be able to design and develop decision trees and understand their construction principles, including the CART, ID3, and C4.5 algorithms, and apply them to real-world problems.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT207TPE51	3	0	0	3 HOURS	30	70	3

INTERNET OF THINGS

Course Objectives:

1. To understand the fundamental concepts of parallel and distributed databases, including the different architectures, parallelism techniques, and design principles.
2. To comprehend the concepts of object-oriented and object-relational databases, including object identity, structure, persistence, and inheritance, and learn how to use them to design efficient database systems.
3. To learn about intelligent databases and their applications, including active databases, temporal databases, deductive databases, and spatial databases.
4. To explore advanced data models, such as mobile databases, multimedia databases, data warehousing, data mining, and text mining, and learn how to use them to design and manage complex data structures.
5. To understand the emerging technologies in the field of database systems, such as XML databases, web databases, cloud-based databases, and big data storage and analysis.

UNIT I – OVERVIEW IoT - An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management

UNIT II – REFERENCE ARCHITECTURE - IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT III – IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS - PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT IV – TRANSPORT & SESSION LAYER PROTOCOLS - Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

UNIT V – SERVICE LAYER PROTOCOLS & SECURITY - Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

REFERENCES

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.

2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI

3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer

4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications

5. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014. 6. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

Course Outcomes:

1. Students will be able to compare and contrast different database system architectures, including centralized, client-server, parallel, and distributed architectures.
2. Students will be able to design object-oriented and object-relational databases using different standards, languages, and design principles, such as ODMG, ODL, OQL, and SQL/Oracle.
3. Students will be able to design intelligent databases that incorporate active rules, temporal databases, deductive databases, and spatial databases to support complex applications.
4. Students will be able to design advanced data models, including mobile databases, multimedia databases, data warehousing, data mining, and text mining, to efficiently manage complex data structures.
5. Students will be able to design and manage emerging technologies in the field of database systems, such as XML databases, web databases, cloud-based databases, and big data storage and analysis.

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
IT207TOE01	3	0	0	3 hours	30	70	3

MACHINE LEARNING

COURSE OBJECTIVE:

1. To expose the applications of machine learning.
2. To study the various algorithms related to supervised and unsupervised learning.
3. To recognize the different types of machine learning models and how to use them.
4. To learn the theoretical and practical aspects of probabilistic graphical models.
5. To acquire the knowledge of various classification techniques.
6. To learn the various neural network algorithms.

UNIT No	Syllabus Content	No of Hours
1	**Introduction to Machine Learning:** Introduction - examples of machine learning applications - Types of machine learning- Mathematical foundations of machine learning– Introduction to Parametric Models – Non-Parametric Models –Probability Basics	8
2	**Supervised Learning:** Linear Models for Regression – Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison, Limitations of Fixed Basis Functions - Linear Models for Classification, Discriminate Functions -Probabilistic Generative Models –Probabilistic Discriminative Models - Bayesian Logistic Regression. Neural Networks – Network Training - Feed-forward Network Functions, Back Propagation Network, Bayesian Neural Network	7
3	**Unsupervised Learning:** Clustering- K-means - EM Algorithm- Mixtures of Gaussians Dimensionality Reduction - Factor analysis - Principal Component Analysis Probabilistic PCA -Independent components analysis - Singular Value Decomposition.	7
4	**Probabilistic Graphical Model:** Graphical Models - Undirected graphical models - Markov Random Fields-Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning - Generalization - Hidden Markov Models -Conditional random fields	7
5	**Genetic Algorithms:** an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING – The Learning Task, Q Learning.	7

Text Books:

1. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 20122.
2. Pattern Recognition and Machine Learning, Christopher Bishop. 2e
3. Machine Learning, Tom M. Mitchell, McGraw-Hill Education (India) Private Limited, 2013

Reference Books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 1st edition, ISBN-13: 978-0387-31073-2, 2006.
2. Introduction to Machine Learning, Ethem Alpaydin, 3rd Edition, MIT Press, ISBN: 9780262028189, 2014.
3. Machine Learning: a Probabilistic Perspective, Kevin Patrick Murphy , 4th edition, MIT Press, ISBN:9780262018029, 2013.
4. Machine Learning for Hackers, Drew Conway, John Myles White, 1st Edition, O'Reilly Media, 2012.
5. Data Mining: Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, Mark A. Hall, 3rd Edition, Morgan Kaufmann, 2011.

COURSE OUTCOMES: The students would have learnt

CO1: Describe the concepts and models of machine learning.
CO2: Design and implement algorithms for supervised and unsupervised learning.
CO3: Develop skills of using recent machine learning software for solving practical problems.
CO4: Analyze the efficient clustering techniques for solving real world problems.
CO5: Implement probabilistic discriminative and generative algorithms for an application andanalyze the results.

SCHEME FOR EXAMINATION
B.TECH (FOUR YEAR) DEGREE COURSE
THIRD YEAR, INFORMATION TECHNOLOGY
SEMESTER VIII
EFFECTIVE FROM SESSION 2023-24

SL. NO.	SUBJECT CODE	SUBJECTS	PERIODS/ WEEK			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	TOTAL	
THEORY									
1	IT208TPC6X	ELECTIVE – VI	3	0	0	30	70	100	3
2	IT208TOE3X	OPEN ELECTIVE - III	3	0	0	30	70	100	3
3	IT208TOE4X	OPEN ELECTIVE - IV	3	0	0	30	70	100	3
PRACTICAL									
1	IT208PPC31	PROJECT-III	0	0	18	60	40	100	9
TOTAL CREDITS									**18**
IA- INTERNAL ASSESSMENT, ESE-END SEMESTER EXAMINATION, L-LECTURE, T-TUTORIAL, P-PRACTICAL									

LIST OF ELECTIVE – VI

1.	IT208TPE61	MACHINE LEARNING
2.	IT208TPE62	OBJECT ORIENTED ANALYSIS & DESIGN
3.	IT208TPE63	SOFTWARE TESTING & QUALITY MANAGEMENT
4.	IT208TPE64	HUMAN COMPUTER INTERFACE

LIST OF OPEN ELECTIVE –III

1.	IT208TOE31	WIRELESS SENSOR NETWORK
2.	IT208TOE32	DIGITAL SIGNAL PROCESSING
3.	IT208TOE33	INFORMATION TECHNOLOGY FOR AUTOMATION
4.	IT208TOE34	REAL TIME SYSTEM

LIST OF OPEN ELECTIVE-IV

1.	IT208TOE01	SOFT COMPUTING
2.	CS208TOE01	ARTIFICIAL INTELIGENCE
3.	EC208TOE03	INTRODUCTION TO IoT
4.	CE208TOE03	INFRASTRUCTURE PLANNING AND MANAGEMENT
5.	ME208TOE03	SUPPLY CHAIN MANAGEMENT
6.	CH208TOE03	PLANT ENGINEERING ECONOMICS AND MANAGEMENT
7.	IP208TOE41	ADVANCED MANUFACTURING PROCESS
8.	IP208TOE51	COMPUTER AIDED PROCESS PLANNING (CAPP)

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
IT208TOE01	3	0	0	3 hours	30	70	3

SOFT COMPUTING

COURSE OBJECTIVE:

1. To familiarize with soft computing concepts.
2. To introduce the fuzzy logic concepts, fuzzy principles and relations.
3. To Basics of ANN and Learning Algorithms.
4. ANN as function approximation.
5. Genetic Algorithm and its applications to soft computing.
6. Hybrid system usage, application and optimization.

UNIT No	Syllabus Content	No of Hours
1	**Introduction to ANS Technology**: Elementary Neurophysiology, models of a neuron, neural networks viewed as directed graphs, feedback from neurons to ANS, artificial intelligence and neural networks.	8
2	**Learning & Training:** Hebbian memory based, competitive, error-correction. **Learning Credit Assignment Problem:** supervised and unsupervised learning, memory models, recall and adaptation, network architecture, single layered feed forward networks, multilayered feed forward networks, recurrent networks, topologies.	7
3	Activation and Synaptic dynamics, stability and convergence. **A suevey of neutral network models:** Single layered perception, least mean square algorithm, multi-layered perceptrons, back propagation algorithm XOR- problem, the generalized delta rule, BPN applications, Adalines and Madalines- Algorithm and applications.	7
4	**Applications:** The traveling salesperson problem, talking network and phonetic typewriter: Speech generation and Speech recognition, character recognition and retrieval, handwritten digital recognition.	7
5	**Adaptive fuzzy systems:** Introduction to Fuzzy sets, and operations, Examples of Fuzzy logic, Fuzzy Associative memories, fuzziness in neural networks, comparison of fuzzy and neural Truck-Backer upper control systems.	7

Text Books:

1. Artificial Neural Networks by B. Yagna Narayan
2. Neural Networks by James A. Freeman and David M.StrapetusReference

Books:

1. Neural Networks- A comprehensive foundation by Simon Hay kin (LPE)

COURSE OUTCOMES: The students would have learnt

CO1: List the facts and outline the different process carried out in fuzzy logic, ANN and Genetic Algorithms.
CO2: Explain the concepts and meta-cognitive of soft computing.
CO3: Apply Soft computing techniques the solve character recognition, pattern classification, regression and similar problems.
CO4: Outline facts to identify process/procedures to handle real world problems using soft computing.
CO5: Evaluate various techniques of soft computing to defend the best working solutions.
CO6: Design hybrid system to revise the principles of soft computing in various applications.

SUB CODE	L	T	P	DURATION	IA	ESE	CREDITS
IT208TPE63	3	0	0	3 HOURS	30	70	3

SOFTWARE TESTING AND QUALITY MANAGEMENT

Course Objectives

- Study fundamental concepts of software testing and its application in various scenarios.
- Understand white box, block box and other testing's.
- Understand the importance of software quality and assurance software systems development
- Understand the quality management, assurance, and quality standard to software.

UNIT I

Software Quality: Ethical Basis for software Quality , Total quality Management Principles, Software Processes and Methodologies , Quality Standards , Practices & conventions, Top Down and Bottom Up Approach.

UNIT II

Software managementReviews and Audits, Enterprise Resource Planning Software, Measurement Theory , Software Quality Metrics, designing Software Measurement Programs , Organizational Learning.

UNIT III

Improving Quality with methodologies: Structured information Engineering , Object-Oriented Software , Reverse Engineering , Measuring Customer Satisfaction Defect Prevention , Reliability Models , Reliability Growth Models.

UNIT IV

Software Quality Engineering: Defining Quality Requirements Management, Complexity Metrics and Models, Management issues for software Quality, Project Tracking and Oversight, Use of CASE tool Technology, Role of Groupware, data Quality Control.

UNIT V

Project Configuration management: Configuration Management Concepts, Configuration Management Process, Document Control, Configuration Management plan of the WAR Project.

List of Books:

1. Stephan Kan, Metrics and Models in Software quality, Addison Wesley.
2. Mark Paulik, The capability Maturity Model-guidelines for improving the software Process, Addison Wesley.
3. Michael, Deutsch, Willis, Ronald r-Software Quality Engineering- A Total Technical and Management approach, Prentice Hall.
4. Ginac, Frank P, Customer Oriented Software Quality Insurance, Prentice Hall.
5. Wilson, Rodney C, Software RX secrets of Engineering Quality Software, Prentice Hall.
6. Pressman, Software Engineering-A practitioner's approach
7. Pankaj Jalote, CMM Project

Course Outcomes

After completion of this course, student will be able to

- Understand importance of testing techniques in software quality management and assurance.
- Identify various types of software risks and its impact on different software application.
- Create test case scenarios for different application software using various testing techniques.
- Apply different testing methodologies used in industries for software testing.
- Describe fundamental concepts of software quality assurance.

SUB CODE	L	T	P	DURATION/WEEK	IA	ESE	CREDITS
IT208TOE31	3	0	0	3 hours	30	70	3

WIRELESS SENSOR NETWORK

COURSE OBJECTIVES:

- To learn about Wireless Networks, architectures and technologies.
- To understand Wireless sensor network platforms: Hardware and Software.
- To learn WSN layers (MAC, Link, Routing).
- To understand & implement Energy management.
- To perform Sensor data acquisition, processing and handling.
- To simulate Signal processing, target localization and tracking, self-organization.
- Case Study of Applications like (health, environmental monitoring, smart home).

UNIT I – FUNDAMENTALS OF SENSOR NETWORKS

Introduction to computer and wireless sensor networks, Motivation for a network of Wireless Sensor nodes- Sensing and sensors-challenges and constraints - node architecture-sensing subsystem, processor subsystem-communication interfaces- prototypes, Application of Wireless sensors

UNIT II- COMMUNICATION CHARACTERISTICS AND DEPLOYMENT MECHANISMS

Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies - Hardware- Telosb, Micaz motes- Time Synchronization- Clock and the Synchronization Problem - Basics of time synchronization-Time synchronization protocols - Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization

UNIT III- MAC LAYER

Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks – Contention free MAC Protocols- characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering - Contention based MAC Protocols- Power Aware Multi-Access with signalling

UNIT IV- ROUTING IN WIRELESS SENSOR NETWORKS

Design Issues in WSN routing- Data Dissemination and Gathering-Routing Challenges in WSN - Flooding-Flat Based Routing – SAR, Directed Diffusion, Hierarchical Routing- LEACH, PEGASIS - Query Based Routing- Negotiation Based Routing- Geographical Based Routing-Transport layer- Transport protocol Design issues- Performance of Transport Control Protocols.

UNIT V - MIDDLEWARE AND SECURITY ISSUES

WSN middleware principles-Middleware architecture-Existing middleware - operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security.

REFERENCES

1. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2011
2. Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocols and Applications", Wiley Inter Science Publications 2010.
3. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge University Press, 2005
4. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "Wireless Sensor Networks", Springer Science 2004.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to-

- Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks
- Apply the design principles of WSN architectures and operating systems for simulating environment situations.
- Apply various concepts for assignment of MAC addresses.
- Select the appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks.
- Analyse the sensor network platform and tools state-centric programming.