MASTER OF SCIENCE IN INFORMATION TECHNOLOGY 2022-24

SCHEME OF TEACHING AND EXAMINATIONS

FIRST SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+((T+P) / 2)	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
MSc(IT)101	Object Oriented Programming with C++	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)102	RDBMS and SQL	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)103	Operating System	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)104	Computer System Architecture	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)105	Web Technology	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)106	**Lab-I**:Programming in C++	-	-	2x2	2	-	50	100	150	-	30	50	**80**
MSc(IT)107	**Lab-II:** Programming in RDBMS,SQL & PL-SQL	-	-	2x2	2	-	50	50	100	-	30	25	55
MSc(IT)108	**Lab-III:** Programming in Web Technology	-	-	2x1	1		50	50	100	-	30	25	55
MSc(IT)109	Personality Development & Mock Interview			2x1	1		25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

FIRST SEMESTER : M.Sc.(IT)101
Object Oriented Programming with 'C++ '

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Student will understand the basic terminology used in computer programming and will be able to design programs involving decision structures, loops and functions.
- Student will understand the dynamics of memory by the use of pointers, understand different data structures and create/update basic data files.
- Skills - At the end of the course, a student will be able to :
  a) Analyse a simple programming problem specification.
  b) Design a high-level (programming language independent) solution to the problem using functional abstraction and general imperative programming language constructs. Write, compile, execute and debug a C++ program which maps the high-level design onto concrete C++ programming constructs

Syllabus

UNIT – I: Language Fundamental

Overview of OOP: The Object Oriented paradigm, Basic concepts of OOP, Benefits of OOP, Object oriented languages, Application of OOP. **Overview of C++:** History of C++, **Data Types:** Built-in data types, User-defined data types, Derived data types. **Constants and Variables:** symbolic constants, Dynamic initialization of variable, Reference variable. Operators in C++. **Control Structures:** if-else, nested if-else, while, do-while, for, break, continue, switch, goto statement.

UNIT – II: Structure & Function

Structures: A Simple structure, Defining a structure variable, Accessing structures member, Enumeration data type. **Function:** Function Declaration, Calling Function, Function Definition, **Passing Arguments to function:** Passing Constant, Passing Value, Reference Argument, Structure as argument, Default Argument. **Returning values from function:** return statement, Returning structure variable, Return by reference. Overloaded Function, Inline Function, Templates.

UNIT – III: Object Classes and Inheritance

Object and Class, Defining the class and its member, Making an outside function inline, nesting of member function, array as class member, structure and classes. **Memory allocation:** memory allocation for objects, new and delete operator, static data member, static member functions, object as function argument. **Constructor & Destructor:** Null and default constructor. Parameterized constructor, Constructor with default argument, copy constructor, class destructors, **Inheritance:** Introduction to inheritance, Types of inheritance ,function overriding, Constructor in Derived class. **Access specifiers:** public, private, protected.

UNIT – IV: Pointers, Virtual Function and Operator Overloading

Pointers: Introduction, & and * operator, pointer to object, this pointer, pointer to derived class. **Dynamic polymorphism:** Virtual function, Pure Virtual Function, Abstract class. **Static Polymorphism:** Operator keyword, overloading unary operator (++(pre increment and post increment),--) using operator function, overloading binary operators (+,-,==,>=,<=, +=,<,>,[]), Friend function, Friend class, overloading binary operators using friend function.

UNIT – V: File & Stream

File and Stream: C++ Stream class, unformatted I/O operations, formatted console I/O, manipulators, opening and closing a file, detecting eof, file modes, get(), put(),reading and writing a class object, Updating a file random access.

RECOMMENDED BOOKS:

- **Object Oriented Programming with C++** : *E. Balagurusamy*, The McGraw-Hill
- **The C++ Programming Language**: *Bjarne Stroustrup*, Addision Wasley.
- **Object Oriented Programming in C++**: *Robert Lafore*, Galgotia Publications.
- **Introduction to Object Oriented Programming**: *K V Witt*, Galgotia Publications.
- **Object Oriented Programming**: *G Blaschek*, Springer Verlag
- **Object Data Management**: *R Cattel*, Addison Wasley.

FIRST SEMESTER : M.Sc.(IT)102
RDBMS and SQL

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Students will be able to design a database based on the given requirements.
- Students will be able to make Database oriented application with knowledge of subject provided to them.
- Students get the knowledge about Standard Query Language statements, PL/SQL, Query processing and optimization.
- Students are expected to apply normalization techniques on given database.
- RDBMS are the basic building blocks of data warehousing, mining, Big Data Analytics, cloud computing etc.

Syllabus

UNIT - I: Overview of Database Management

Data, Information and knowledge, Importance of database oriented approach to data management; data independence, database administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational. Introduction to distributed databases, Client/Server databases, Object-oriented databases, Object-relational databases, Introduction to ODBC concept.

UNIT - II: ER Model & Relational Algebra

Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Concept of keys; Case studies of ER modeling Generalization; specialization and aggregation. Converting an ER model into relational Schema. Extended ER features.

Relational Algebra: select, project, cross product different types of joins (inner join, outer joins, self-join); set operations, Tuple relational calculus, Domain relational calculus, Simple and complex queries using relational algebra, stand alone and embedded query languages.

UNIT - III : Normalization

Introduction, Pitfalls in database design, update anomalies: Functional dependencies, Join dependencies, Normal forms (1NF, 2NF, 3NF). Boyce-Codd Normal form, Decomposition, Multi-Valued Dependencies, 4NF, 5NF.Issues in physical design; Concepts of indexes, Denormalization. Protecting the Data Base - Integrity, Security and Recovery. Domain Constraints, Referential Integrity, Assertion, Security & Authorization in SQL.

UNIT - IV: SQL and Relational Database Design

Introduction to SQL constructs (SELECT...FROM, WHERE... GROUP BY... HAVING...
ORDERBY....), CREATE, INSERT, DELETE, UPDATE, ALTER, LIKE, DROP, VIEW definition and use, Temporary tables, Nested queries, and correlated nested queries, Integrity constraints: Not null, unique, check, primary key, foreign key, references. Transaction control commands -grant, privileges, commit, Rollback, Savepoint.

UNIT - V: PL/SQL

Introduction to PL/SQL variables - literals - data types - advantages of PL/SQL; Control statements : if ; iterative control - loop, while, for, goto ; exit when; Cursors : Types -implicit, explicit - parameterized cursors - cursor attributes; Exceptions: Types - internal , user-defined , handling exceptions - raise statement; Triggers; PL/SQL tables and records: Declaring PL/SQL tables - referring PL/SQL tables, inserting and fetching rows using PL/SQL table, deleting rows; records - declaration of records - deleting records; Sub programs: Functions -procedures - in, out, inout parameters; purity functions - packages - package specification -advantages of packages - private and public items - cursors in packages.

BOOKS RECOMMENDED:

- **Database System Concept**: *A. Silberschatz , H.F. Korth and S. Sudarshan*, TMH
- **Fundamentals of Database Systems**: *Elmasri & Nawathe*, Pearson Education
- **An Introduction to Database Systems**: *C. J. Date*, AWL Publishing Company
- **SQL, PL/SQL**: *Ivan Bayross*, BPB Publication
- **An Introduction to database systems**: *Bipin Desai*, Galgotia Publication.
- **Database Management System**: *A. K. Majumdar & P. Bhattacharya*, TMH

FIRST SEMESTER : M.Sc.(IT)103
Operating System

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Student will come to know the basics of how does operating system work.
- They will inculcate knowledge of basic functions of operating system like memory management, disk scheduling etc.
- They develop critical thinking to manage processes and learn managing hardware and software both.
- Students develop internal knowledge of system handling.

Syllabus

UNIT – I: Introduction
Defining operating system, History and Evolution of operating system, Dual mode operation in operating system, **Basic Concepts**: batch processing, spooling, multiprogramming, multiprocessor system, time sharing, real time systems, Functions and Goals of operating system, Operating system as resource manager, Operating system as an abstract machine.

UNIT – II: Processor Management
Process concept, Process Control Block, **Process State**: State Transition Diagram, **Scheduling Queues**: Queuing Diagram, Types of schedulers-context switching and dispatcher, various types of CPU scheduling algorithms and their evaluation, multilevel queues and multilevel feedback queues, Thread life cycle, multithreading,

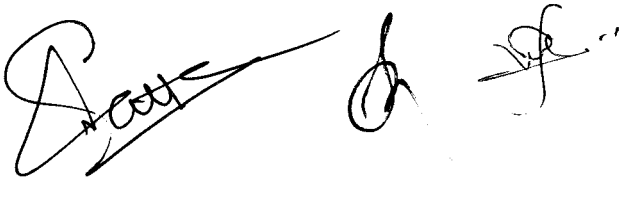
UNIT – III: IPC and Dead Locks
Inter Process Communication: competing and co-operating processes, Introduction to concurrent processing, Precedence graphs, Critical section problem, Semaphore concept, Study of classical process synchronization problems: Producer–Consumer, Dining Philosophers. **Deadlocks**: The dead lock problem, dead lock definition, **Deadlock Characterization**: necessary condition, resource allocation graph, **Deadlocks handling**: Deadlock prevention, Deadlock avoidance, Banker's algorithm, Deadlock detection, Recovery from Deadlock.

UNIT – IV: Memory Management
Preliminaries of memory management, Contiguous memory allocation, partitioned allocation MFT, fragmentation, MVT, partition allocation policies, compaction, Non-Contiguous memory allocation, Paging, Structure of page table, Segmentation, **Virtual Memory**: Concepts, demand paging, Swapping, **Page replacement policies**: FIFO, Optimal, LRU, MRU, Thrashing. **Secondary Storage**: Hierarchy, physical characteristics, evaluation of disk access time and data transfer rate, **Scheduling algorithms**: FCFS, SCAN etc.

UNIT – V: File and Device Management
File concept: file types, file directory maintenance, file sharing, basic file system structure, access methods-sequential and direct access, free space management contiguous, linked allocation and indexed allocation and their performances. **Protection and Security**: principle of protection, domain structure, access matrix, access control, the security problems. **Distributed systems:** Introduction & Features, Types of distributed OS.

BOOKS RECOMMENDED:

- **A text book of Discrete Mathematics:** *Swapan Kumar Sarkar.* S.Chand & company Ltd.
- **Discrete Mathematical structure with applications to computer science:** *J.P Trembly & R. Manohar.* TMH
- **Discrete Mathematics:** *K.A Ross and C.R.B Writht.*
- **Discrete Mathematics Structures for computer science:** *Bernard Kohman & Robert C. Bushy.*
- **Discrete Mathematics:** *Seymour Lipschutz Mare Lipson.* TMH Edition.



FIRST SEMESTER : M.Sc.(IT)104
Computer System Architecture

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Student develops an intuitive knowledge of circuitry design of electronic components.
- Students will be able to understand the overall internal architecture of computer in detail and also the digital representation of data in a computer system
- Understand the general concepts in digital logic design, including logic elements and their use in combinational and sequential logic circuit design.
- Understand computer arithmetic formulate and solve problems, understand the performance requirements of systems.

Syllabus

UNIT – I Representation of Information and H/w component
Number system (decimal, BCD, octal, hexadecimal) and conversions, r and r-1's complement, Fixed and Floating point representation, Binary codes: Excess-3, ASCII, EBCDIC, Error detection codes. Boolean Algebra, Map simplification K-Map, Logic Gates, **Combinational Circuit:** Half and Full Adder, Decoder and Multiplexer; **Sequential Circuit:** Flip-Flop (SR, D, JK, Master-Slave,T), 4 bit Register, Register with parallel load, Shift register, Binary ripple Counter, Binary synchronous counter.

UNIT – II Register transfer language and micro operations
Register Transfer Language (RTL), Concepts of bus, Bus and Memory transfers, **Micro-operation:** Arithmetic, Logic and Shift micro operation, Instruction code, Computer registers, Computer instructions, Timing and control, Instruction Cycle and Interrupt Cycle, Memory reference instructions, Input-output and interrupt, Design of basic computer

UNIT – III Programming Computers and CPU
Machine Language, Assembly Language, Assembler, Program Loops, Input /Output, Programming, General register organization, Stack organization, Instruction format, Addressing modes, Data transfer and manipulation language, Micro-programmed and Hardwired control, RISC Vs. CISC, **Pipelining in CPU design:** , Parallel Processing ,Arithmetic and RISC pipelining.

UNIT – IV Computer Arithmetic and I/O Techniques
Addition, Subtraction, Division and Multiplication Algorithm, Input-Output Interface, asynchronous data transfer; **Modes of transfer:** Programmed I/O, Interrupt Mechanism, Direct Memory Access (DMA), I/O Processor.

UNIT – V Memory Organization
Memory hierarchy: Static and Dynamic RAM, ROM; Building large memory using chips, Associative Memory: associative mapping, Direct mapping, set associative mapping; Cache Memory Organization, Virtual Memory.

BOOKS RECOMMENDED:

- **Computer System Architecture**, *Morris Mano*, PHI, 3rd Edition)
- **Computer Organization and Architecture**, *William Stalling,* PHI
- **Computer organization and Architecture**, *J.P.Hayes,* TMH.
- **Digital Computer Logic Design**, *Morris Mano* ,PHI
- **Computer System Architecture and organization**, *Dr. M. Usha, and T. S. Shrikant*, Wiley publication.
- **Digital Computer Electronics**, *Malvino.*
- **Structured Computer Organization**, *Andrew S. Tanenbanm,* PHI
- **Modern Digital Electronics**, *R.P.Jain*, TMH
- **Fundamental of microprocessors**, *B. Ram*

FIRST SEMESTER : M.Sc.(IT)105
Web Technology

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Student will be familiar with fundamentals of computers and organization of computer various Internet protocols and the concepts of Internet.
- Students will able to differentiate between various e-mail protocols and their working.
- Students will be familiar with the concept of remote login with the understandability of hosting and maintaining of website.
- Students will also get knowledge about Internet security and Firewalls.

Syllabus

UNIT – I

Introduction to Computer and Hardware: Introduction of Information Technology, History of Computers, Organization of computers, Number Systems, Programming language and types, Public domain software, Applications of Information Technology in business, industry, entertainment, science, engineering and medicine.

UNIT – II

Internet and its Application: Evolution of internet, Internet applications, TCP/IP, Addressing in Internet (IP), Domains, Internet service providers, Connectivity such as dial up, leased line, VSAT. E-mail protocols (X-400, SMTP, UUCP), Description of E-Mail headers, Email routing, e-mail client, POP-3, IMAP- 4.

UNIT – III

FTP and Telnet: Introduction to File Transfer Protocol (FTP), Types of FTP servers (including anonymous), Telnet protocol, Telnet client, Terminal emulation. Usenet and Internet relay chat, Web publishing tool, Website planning, Website Hosting , Multiple sites on one server, Maintaining a web site, WWW servers, HTTP & URLs, Registration of website on search engines , maintenance of website.

UNIT – IV

Dynamic HTML and Web Designing: HTML Basic concepts, Web designing issue, Structure of HTML documents, HTML Elements: Core attributes, Language attributes, Linking Basics, Linking in HTML, Images and Anchors, Anchor Attributes, Image Maps, Semantic Linking Meta Information, Image Preliminaries, Image Download issues, Images as Buttons, Introduction to Layout: Backgrounds, Colors and Text, Fonts, Layout with Tables, Introduction to CSS.

UNIT – V

Internet Security: Internet security vulnerability and threats, Firewalls, Introduction to AAA, Malwares. **E-Commerce**: Introduction, Concepts & technology, Advantages, Limitations, Various electronics payment system, Payment Gateways, Introduction to EDI.

BOOKS RECOMMENDED:

- **Computers Today**, *S.K.Basadra*, Galgotia Publication..
- **Internet for Every One**, *Alexis Leon and Mathews Leon*, Tech World.2008 print.
- **Introduction to Computers**, *P.K.Sinha*, BPB Publication.
- **Fundamentals of Computers**, V. Rajaraman, Prentice Hall of India.
- **HTML Complete Reference**, *Thomas A. Powell*, TMH
- **Frontiers of Electronics of Commerce** , *Ravi kalakota & Andrew B. Whinston*, Addison Wesley

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY 2022-24

SCHEME OF TEACHING AND EXAMINATIONS

SECOND SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P	L+((T+P) / 2)	Th	Ses	Pr	Total	Th	Ses	Pr	Total
MSc(IT)201	Programming in .NET Technology	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)202	Data Structures	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)203	Computer Network & Cyber Security	3	2	-	4	100	25		125	40	15	-	55
MSc(IT)204	**Elective –I** 1. Big Data Analytics 2. Cloud Computing 3. Theory of Computation	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)205	**Elective –II** 1. AI & Expert System 2. Internet of Things 3. Soft Computing	3	2	-	4	100	25	-	125	40	15	-	55
MSc(IT)206	**Lab-IV**: Programming in . NET	-	-	3x2	3	-	50	100	150	-	30	50	**80**
MSc(IT)207	**Lab-V**:Programming in Data Structure	-	-	2	1	-	50	50	100	-	30	25	55
MSc(IT)208	**Lab-VI:** Practical based on Computer Network	-	-	2	1	-	50	50	100	-	30	25	55
MSc(IT)209	Group Discussion	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

SECOND SEMESTER : M.Sc.(IT) 201
Programming in .NET Technology

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Students will understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
- Students will describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE).
- Students will create applications using Microsoft Windows Forms and also ADO .NET
- Students will be able to design web applications using ASP.NET

Syllabus

UNIT – I: Introduction to the .NET framework:
Overview of .net framework, Managed Execution process, CLR, .Net Framework class library, common language specification, Common Type System, JIT Compilation, MSIL, Assemblies, metadata, Garbage collection. **Windows form**: Working with Visual Studio IDE, creating a .NET solution, MDI application.

UNIT – II: Programming with .NET Framework
components and controls: , Data types, variables, Constant, Enumerations, Declaring Enumeration, Type conversions, Operators, **Control Structures**: conditional statements, loops, **Arrays:** creating array in vb.net, Dynamic arrays, Multi-dimensional arrays, Jagged Array, The Array class, Method of Array Class, **Functions:** defining Function, Function returning a value, Recursive function, Param Arrays, Passing Array as Function Arguments, Defining Sub procedures, Passing Parameters by Value and by reference.

UNIT – III: OOPS and Exception Handling Types, structures:Declare a structures, structures variable, structures and array, structures and objects, structures and procedures, structures within structures. classes : class Definition,Member fnctions and Encapsulation,Constructor and Destructors, Parameterized Constructor, Shared Members of vb.net Class, Inheritance: Base and Derived Classes, Base Class Initialization, MyBase, Interfaces:creating interfaces, using multiple interfaces, using the MustInherit keyword(creating abstract classes), using MustOverride, MustOverridable, and NotOverridable, Polymorphism, Inheritance based polymorphism, Interface based polymorphism. Exception Handling: Try catch statement, Exception classes in .Net Framework, Handling Exceptions, Creating User define Exceptions.

UNIT – IV: Building .NET Framework Applications
Introduction to ASP .NET, Differentiate classic ASP and ASP .NET, Asp.net- Life Cycle, , Asp.net state management, Web application, Web forms, Controls in web forms, Events in Web form, Form validations – Client side, Server side.

UNIT – V: Database Programming in .NET
ADO .NET Architecture, .NET data provider, dataset components, ADO. NET Adapter and Dataset, ADO.Net Dataview and Datagrid view, creating database applications using Window forms and web forms (Database connectivity through ADO .NET). Introduction to web services.

BOOKS RECOMMENDED:

- **MSDN online – by Microsoft**
- **Visual Basic .NET Complete** - BPB Publications, New Delhi.
- **The Complete Reference VB .NET**, *Jeffery R. Shapiro*, Tata McGraw Hill.
- **Professional VB .NET 2003**, *Bill Evjen & others*, Wiley India (P) Ltd.

SECOND SEMESTER : M.Sc.(IT) 202
Data Structures

Max Marks: 100 **Min Marks : 40**

Course Outcomes

- Students will be able to design the appropriate data structures and algorithms for solving real world problems and enables them to gain knowledge in practical applications of data structures.
- Choose efficient data structures and apply them to solve problems and analyze the efficiency of programs based on time complexity.
- Student gets analytical ability to create better design of computer applications.
- There is number of technique such as Searching, Sorting, Tree and Graph so that student gain the reasoning ability to implement these concept in development of live commercial applications

Syllabus

UNIT – I Array and Linked Lists

Algorithm: **Concept of Algorithm, definition, characteristics of algorithm,** algorithmic notation, analysis of algorithm, rate of growth, time, Basic time and space analysis of an algorithm, Asymtotic notation. **DataStructure: Definition, Types of Data Structure, Data Structure operation.**

Array: Linear Array, Representations of Array in Memory, Traversing, Insertion and Deletion in Linear Array, Multidimensional Array.

Linked list, Representation of linked lists in memory, Traversing a linked list, Searching a linked list, Memory Allocation, Insertion into a linked List, Deletion from a Linked List, Header Linked List, Two- Way Linked Lists, Circular Linked List.

UNIT – II Stack and Queues

Stacks Definition, concepts, operation and application of Stacks, Recursion and Polish notations, Quick sort, tower of Hanoi, Queue, Priority Queue: definition concepts, operation and application of Queue, circular queue and Dequeue. Linked representation of stack and queue.

UNIT – III Trees and Its Representation:

Terminologies related to trees, Binary Tree, complete binary tree, almost complete binary tree; Tree Traversals-preorder, in order and post order traversals, their recursive implementations, Expression tree-evaluation, Linked representations of binary tree, operations. header nodes; threads, **Binary Search Tree:** searching, Inserting and deleting in BST, Heap; Path Lengths; Huffman's Algorithms. Basic idea of AVL Tree.

UNIT – IV Graphs:

Related definitions; Graph representations- adjacency matrix, adjacency list, adjacency multi-list; Traversal schemes - depth first search, breadth first search; Minimum spanning tree; Shortest path algorithm; Kruskal and Dijkstra's algorithms.

UNIT – V Searching, Hashing and Sorting:

Searching : Linear Search, Binary Search, Searching and data modification Hashing- Basics, methods, collision, resolution of collision, chaining; Internal Sorting, External sorting - Bubble Sort, Insertion Sort, Selection Sort, Merge sort, Radix sort, heap sort.

BOOKS RECOMMENDED:

- **Fundamental of Data Structures**, *Horowitz and Sahani*, Galgotia Publishers.
- **Data Structures and Program Design in C**, *Kruse R.L*, PHI.
- **Data Structures using C and C++**, *Tanenbaum*, PHI.
- **Data Structures**, Schaum Series.
- **Data Structures**, *Bhagat Singh.*
- **Data Structures** - *Trembley and Sorenson.*

SECOND SEMESTER : M.Sc.(IT) 203
Computer Networks & Cyber Security

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- To give the students a basic understanding of computer network.
- To give the students the basic concepts of bandwidth, data communication etc.
- To make the students more employable.
- To open up new areas in the field of research and development in the area of computer networking.

Syllabus

UNIT – I

Introduction to Computer Networking: The Concept of Networking, Data Communication, Required network elements, The role of Standards Organization. Line Configuration, Various Topologies, Transmission Mode, Categories of Networks- LAN, MAN, WAN. The benefits of a Computer Networks. The OSI and TCP/IP Reference Model: The Concept of Layered Architecture, Design Issues for the Layers. Interfaces and services, Detailed Functions of the Layers. Comparison between OSI and TCP/IP Reference model.

UNIT – II

Transmission of Digital Data: Bandwidth, Nyquist and Shannon's theorems for maximum data rate of a channel. Transmission media- Co-axial, UTP, Fiber optic and wireless. Analog and digital data Transmission- Serial and Parallel transmission. Modulation Techniques – AM, FM, PM. ADSL Modem. Multiplexing and Switching: The Concept of Multiplexing- FDM, TDM, WDM, CDM. The Concept of Switching- Circuiting, Message switching, Packet switching. Virtual Circuit and Datagram.

UNIT – III

Data Link Layer : Line Discipline, Flow Control- stop and wait, sliding window, Go back N, Selective Repeat. Error Detection and Correction – Parity, CRC, Hamming Code. ALOHA, Slotted ALOHA, CSMA/CD, HDLC. IEEE standards for LAN's and MAN's – Ethernet, DQDB
The concept of ICMP, ARP, RARP, SNMP, SMTP, MIME, POP3 Protocols.

UNIT – IV

Network Layer and Transport Layer: IP Addressing, Classes of IP Addresses, Subnet Mask. IPv4 and IPv6 Header Formats. Routing algorithms - Distance Vector, Link State. TCP Header Format, UDP Header Format. Congestion Control Algorithms – Leaky Bucket and Token Bucket. Internetwork, Networking Devices – Repeater, Bridge, Router, Gateway, Switch, Hub

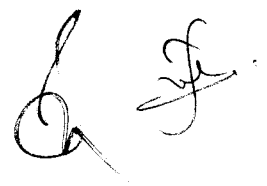
UNIT – V

Cyber Security and Networking Technologies: The Importance of Security in Networking. Confidentiality, Authentication, Integrity, Non Repudiation. Traditional Cryptography - Data Encryption Standards, RSA algorithm. Deffie Hellman Algorithm. Virus, Worm, Trojan Horse, DoS, Spoofing, Phishing.

X.25, Frame Relay, Cell Relay -ATM, ATM Cell, ATM Switch – Multistage Switch. Banyan Network. DSL, ADSL, SONET, SMDS.

BOOKS RECOMMENDED:

- Computer Networks - A. S. Tanenbaum
- Data Communication and Networking - B. A. Forouzan



SECOND SEMESTER : M.Sc.(IT) 204
Elective I : 1. Big Data Analytics

Max Marks : 100 **Min Marks : 40**

Course Outcomes

After the completion of course, Student must be able

- To understand the building blocks of Big Data.
- To articulate the programming aspects of cloud computing (map Reduce etc). Also get the knowledge about the big data programming languages apache, pig, hive and spark.
- To understand the specialized aspects of big data with the help of different big data applications.
- To represent the analytical aspects of Big Data along with the knowledge of bigdata database such as mongodb and nosql.
- To know the recent research trends related to Hadoop File System, MapReduce and Google File

Syllabus

UNIT – I: Introduction to Data Warehousing and OLAP Technology for Data Mining
What is Data Mining?, KDD(Knowledge Discovery from Databases) Process, What Kinds of Data Can Be Mined?, Data Mining Functionality, Are all the patterns interesting?, Attribute Types, What is Data Warehouse?, Data Warehouse Architecture, Data Cube: A multi-dimensional data model, Schemas for Multidimensional Data Models, OLAP Operations, Data Warehouse Usage(Applications). , Data Mining Primitive, Architecture of Data Mining System.

UNIT – II: Introduction Concept of Big Data
Big Data- Define Data, Web Data, Classification of Data- Structured, Semi-Structured, and Unstructured. Big Data Definitions, Challenges of Conventional system, Why We Need Big Data, Difference between Big Data and Small Data, Importance of Big Data. Big Data Characteristics (4V's Volume, Velocity, Variety, and Veracity), Big Data Types, Big Data Handling Techniques. Complexity of Big Data, Big Data Processing Architectures, Big Data Technologies, Big Data Business Value. Big Data Analytics Application. Big Data Challenges and Future Scope.

UNIT – III: INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE
Big Data – Apache Hadoop & Hadoop EcoSystem: Hadoop Core Component, Features of Hadoop, The Hadoop Distributed File System: HDFS data Storage, Hadoop Physical Organization, HDFS Commands, MapReduce Framework, MapReduce Programming Model, MapReduce Map task,Reduce Task and MapReduce Execution, Hadoop YARN, Hadoop2 Execution Model, Hadoop Ecosystem Tools, Hadoop Ecosystem.

UNIT – IV: NoSQL Big Data Management, Mongo DB
NoSQL: What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NoSQL DataStore, NoSQL Data Architecture pattern, NOSQL to Manage Big Data. **Data Base for the Modern Web:** Introduction to MongoDB, features of MongoDB, Data Types,Mongo DB Query Language and Database Command.

UNIT – V: Hive and Pig:
Pig: Apache Pig, Application of Apache Pig, Feature, Pig Architecture, Pig- Grunt Shell, Installing Pig, Pig I atin Data Model, Pig Latin and Developing Pig Latin Scripts: Apache Pig Execution, Commands. **HIVE AND HIVEQL. Hive:** Introduction, Characteristics, limitation, Hive Architecture and Installation, Comparison with Traditional Database (RDBMS), Hive Datatype and File Formats, Hive Data Model, Hive Integration and Workflow Steps, Hive Built-in Functions, HiveQL.

BOOKS RECOMMENDED:

- **Big Data Analytics**, *Raj Kamal and Preeti Saxena*, McGraw Hill Education
- **Big Data: Black Book**, *DT Educational Services*, Dreamtech Press
- **Big Data Analytics**, *Seema Acharya & Shubhashini Chellappan*, Wiley India
- **Big Data Analytics**, *M. Vijayalakshmi & Radha Shankarmani*, Wiley India

SECOND SEMESTER : M.Sc.(IT) 204
Elective I : 2. Cloud Computing

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Students will be able to perform cloud oriented analysis.
- Students will be able to model cloud candidate derived from existing business documentation.
- Students will be able to design the composition of a cloud services and also to design application services for technology abstraction
- student will be able to appreciate the cloud computing paradigm, recognize its various forms and able to implement some cloud computing features

Syllabus

Unit – I

Introduction: Cloud Computing: Vision, Definition, Reference Model, Characteristics, Benefits and Challenges, Historical Developments, Cloud Computing Environments, Cloud Platforms and Technologies; The Evolution of Cloud Computing: Parallel Computing vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Introduction of Grid Computing.

Unit – II

Virtualization: Introduction, Characteristics, Taxonomy of Virtualization, Levels of Virtualization, Structure and Mechanism of Virtualization, Virtualization and Cloud Computing, Advantages and Disadvantages, Virtualization Technology Examples: Xen, VMware, Microsoft Hyper-V.

Unit – III

Cloud Computing Architecture: Service Oriented Architecture, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Data Storage as a Service (DSaaS). Types of Clouds; Economics of the Cloud and Open Challenges; **Security and Organizational aspects**: Host Security and Data Security.

Unit – IV

Migration to the Cloud: Adoption and use of Cloud by Businesses (Small and Enterprise), Pace of Adoption, Benefits and Phases of Adoption, Cloud Service Provider's Capabilities and Liabilities, Success factors and Issues. **Migrating Applications**: Key Aspects, Migration Techniques, Phases of Migration. **Service Level Agreement (SLA)**: Aspects and Requirements, Availability and Outages, Credit Calculations, SLA Samples.

Unit – V

Industry Platforms: Amazon Web Services, Google AppEngine, Microsoft Azure; **Cloud Applications**: Scientific Applications, Business and Consumer Applications; Advanced Topics: Energy Efficiency in Clouds, Market Based Management, Federated Clouds / InterCloud, Third Party Cloud Services.

BOOKS RECOMMENDED:

- **Mastering Cloud Computing**, *Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi*, McGraw Hill Education
- **Cloud Computing: Black Book**, *Kailash Jayaswal et al.*, Kogent Learning Solutions, Dreamtech Press
- **Cloud Computing: Principals and Paradigms**, *Rajkumar Buyya et al.*, Wiley India
- **Cloud Computing: Concepts, Technology & Architecture**, *Erl*, Pearson Education India
- **Cloud Computing Bible**, *Barrie Sosinsky*, O'Reilly Media
- **Cloud Computing: A Practical Approach**, *Toby Velte, Anthony Vote and Robert Elsenpeter*, McGraw Hill
- **Cloud Application Architectures: Building Applications and Infrastructures in the Cloud**, *George Reese*, O'Reilly Media.
- **Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance**, *Tim Matherm Subra Kumaraswamy and Shahed Latif*, O'Reilly Media.

SECOND SEMESTER : M.Sc.(IT) 204
Elective I : 3. Theory Of Computation

Max Marks : 100 **Min Marks : 40**

Course Outcomes

At the end of this course students will:

- Be able to construct finite state machines and the equivalent regular expressions.
- Be able to prove the equivalence of languages described by finite state machines and regular expressions.
- Be able to construct pushdown automata and the equivalent context free grammars.
- Be able to prove the equivalence of languages described by pushdown automata and context free grammars. Be able to construct Turing machines and Post machines

Syllabus

UNIT – I

Alphabet, String and language, Finite state Machines, finite automata with Є-moves, Conversion of NDFA to DFA, Removal of Є-transition from NDFA, Two way finite automata, finite automata with output, Mealy & Moore machines, Applications of finite automata, minimization of finite automata.

UNIT – II

Chomsky classification of Languages, Regular Expression and Language, Properties of Regular languages, Pumping lemma for regular sets, Closure properties of regular sets, Decision algorithms for Regular sets, Myhill-Nerode theorem.

UNIT – III

Context free grammars and their properties, derivation tree, simplifying CFG, ambiguity in CFG, Chomsky Normal form, Greibach Normal form, Pumping lemma for CFL, Closure properties of CFL.

UNIT – IV

Pushdown automata: Informal description, Definition, Determinism and Non determinism in PDA, Equivalence of PDA's and CFL's. Two way PDA, Concept of Linear Bounded Automata, context sensitive grammars and their equivalence, Turning machine construction, determinism and non-determinism in TM, Multi tape, multi-track TM.

UNIT – V

Decidability, Universal turning machine and decidable problem, recursive function theory, Recursively enumerable sets, recursive sets, partial recursive sets, Church's hypothesis, post correspondence problem, Russell's paradox.

BOOKS RECOMMENDED :

- **Theory of Computer Science, Automata Languages & computation**, *K.L.P. Mishra, N. Chandrashekharan*, PHI.
- **Introduction to Automata Theory Language and Computation**, *John E. HopcraftandJeffary D. Ullman*, Narosa Publication house.
- **Introduction to Formal Languages, Automata Theory and Computation**, *Kamala Krithivasan and Rama. R*,Pearson.
- **Introduction to Automata Theory Languages and Computation**, *John E. Hopcraft, Jeffary, D. Ullman and Rajeev Motwani.*

SECOND SEMESTER : M.Sc.(IT) 205
Elective II : 1. Artificial Intelligence & Expert Systems

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Student will have ability to define the heuristics and apply them for solving complex problem with understanding of different heuristic based search techniques.
- Student will have understanding of different knowledge structure and inference mechanism with ability to apply them in intelligent solutions of complex problem.
- Student will understand the existence of uncertainty in problem solving and how mathematical /statistical models are used to overcome these problems.
- Students will understand planning system and different types of planning required for problem solving process

Syllabus

UNIT – I

Introduction to AI: Foundations of AI, Philosophy and History; AI problems, AI technique; The Turing Test. **Intelligent Agents:** Agents and Environments, the Concept of Rationality, the Nature of Environments and the Structure of Agents. **Problem solving & State Space Search:** General problem solving: defining problems as State Space Search, Problem Characteristics; Production Systems & their characteristics.

UNIT – II

Exhaustive Searches: Generate and Test, Breadth First Search, Depth First Search and DFID
Heuristic Search Techniques: Branch and Bound technique; Best first search; A* algorithm; Problem Reduction AND/OR Graphs and AO* algorithm. **Local Searches & Optimizations:** Hill climbing and its variants. **Constraint Satisfaction Problems:** Definition; Constraint Propagation and Backtracking. **Game Playing:** Mini-Max Search Procedure; Alpha-Beta Cutoffs; Additional Refinements.

UNIT – III

Knowledge Representation: Types of Knowledge; Knowledge Representation Issues; **Logic:** First order Predicate Logic; Representation of facts in FOL; Inference in FOL; Resolution Principle, Clausal Form and Unification; **Inference Mechanisms:** Forward and Backward Chaining; **Slot and Filler Structures:** Semantic Networks; Frame Systems and value inheritance; Conceptual Dependency; Scripts;

UNIT – IV

Reasoning under Uncertainty: Non-monotonic Reasoning, Logics for Non-monotonic Reasoning, Default Reasoning, Minimalistic Reasoning, Implementation Issues, Truth Maintenance Systems; Probabilistic Reasoning and Uncertainty; Statistical Reasoning; Probability Theory; Bayes Theorem and Bayesian networks; Certainty Factor; Dempster-Shafer Theory. **Planning:** Overview; The Blocks Word; Component of a Planning System: Goal Stack Planning; Nonlinear Planning;

UNIT – V

Expert Systems: Introduction, Characteristics, History and Applications of expert systems; Expert System Shells; Rule Based Systems Architectures, Non Production System Architectures; Knowledge Acquisition and Validation; Case Studies: MYCIN & DENDRAL. **Learning:** Rote learning; Learning by Taking Advise; Induction; Explanation based learning; Discovery; Analogy.

BOOKS RECOMMENDED:

- **Artificial Intelligence**, *Rich E., Knight K. and Nair S. B.*, McGraw Hill Education
- **Artificial Intelligence: A Modern Approach**, *Russell S. J. and Norvig P.*, Pearson Education
- **Introduction to Artificial Intelligence and Expert Systems**, *Patterson D. W.*, PHI
- **Principles Of Artificial Intelligence**, *Nilson N. J.*, Narosa Publications
  Artificial Intelligence, *Winston P. H.*, Pearson Education

SECOND SEMESTER : M.Sc.(IT) 205
Elective II : 2. Internet of Things

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Describe what IoT is and how it works today and recognise the factors that contributed to the emergence of IoT
- Design and program IoT devices and use real IoT protocols for communication
- Secure the elements of an IoT device
- Design an IoT device to work with a Cloud Computing infrastructure.
- Transfer IoT data to the cloud and in between cloud providers

Syllabus

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 Architecture Introduction, 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 Transmission Control Protocol (TCP), Multipath Transmission Control Protocol (MPTCP), User Datagram Protocol (UDP), Datagram Congestion Control Protocol (DCCP) , Stream Control Transmission Protocol (SCTP), Transport Layer Security (TLS), Datagram Transport Layer Security (DTLS))
Session Layer- Hyper Text Transfer Protocol (HTTP), Constrained Application Protocol (CoAP), Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP), Message Queue Telemetry Transport (MQTT)

Unit – V SERVICE LAYER PROTOCOLS & SECURITY:
Service Layer – oneM2M, European Telecommunications Standards Institute (ETSI) M2M (Machine-to-Machine), OMA, BBF – Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, Routing Protocol for Low-Power and Lossy Networks (RPL), Application Layer

BOOKS RECOMMENDED:

- **From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**, *Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,* Academic Press, 2014
- **Learning Internet of Things**, *Peter Waher*, PACKT publishing
- **Architecting the Internet of Things**, *Bernd Scholz-Reiter, Florian Michahelles,* Springer
- **Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications**, *Daniel Minoli,* Willy Publications
- **Internet of Things (A Hands-onApproach)**, *Vijay Madisetti and ArshdeepBahga*, VPT, 2014.

SECOND SEMESTER : M.Sc.(IT) 205
Elective II : 3. Soft Computing

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Students will be able to understand Artificial Neural Network concept with the help of Biological Neural Network.
- Students will be able to implement algorithms to train ANN by using learning algorithms.
- Students will be able to test fuzzy set operations and binary relations.

Syllabus

UNIT - I: Introduction to Fuzzy Logic System
Fuzzy Sets Operation Of Fuzzy Sets, Properties Of Fuzzy Sets, Fuzzy Relations, Fuzzy Arithmetic, Membership Functions, Fuzzy To Crisp Conversion. Fuzzy Logic, Fuzzy Rule Based Systems, Fuzzy Decision Making, Fuzzy Database, Fuzzy Intelligent System.

UNIT - II: Introduction to Artificial Neural Networks
Introduction to Artificial Neural Network, Artificial Neuron, Classification of Artificial NeuralNetwork, Architecture of a Artificial Neural Network, Activation Function, Training an Artificial Neural Network, Application of Artificial Neural Network.

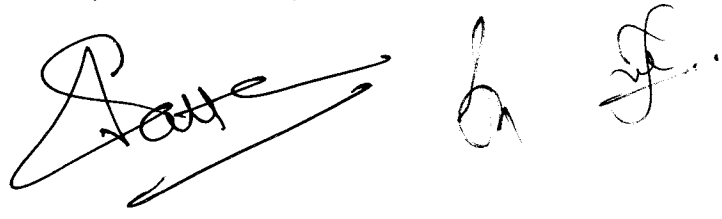
UNIT - III: Perceptron and Associative Memories
Amari General Learning Rule, HEBB Learning Rule, ADLINE, Perceptron Layer Network, Associative memory: Auto associative Memory, Bi-directional memory, Back-propagation Network: Architecture, Training Algorithm Application of Back-propagation algorithm

UNIT - IV: Evolutionary Computing
Introduction, overview of evolutionary computing, Genetic algorithms and optimization, The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms with fuzzy logic, Known issues in GAs.

UNIT - V: Soft Computing Tools
Introduction to MATLAB, Features, Using MATLAB as a Calculator, Creating MATLAB Variables, Basic Plotting: Creating simple plots, adding titles, axis labels and annotations, specify line style and color, Matrix Genertaion : vector, matrix, matrix indexing,creating submatrix, transposing matrix, concatenation, generation of matrix, Programing in MATLAB: M-File scripts, Control flow and operators. Toolbox Introduction, Introduction to Simulink.

BOOKS RECOMMENDED:

- **Soft Computing**, SarojKaushik, TMH Publications.
- **Fuzzy systems and Fuzzy Logic**, *Klir and Uuna*, PHI Publications.
- **Introduction to Artificial Neural Networks**, *S. N. Sivanandam and M. Paulraj*, Vikas publication.
- **Soft Computing and Intelligent systems Design**, *Fakhreddine O. Karry and Clarence de Silva*
- **Neural Network Design**, *Hagan & Demuth*, Vikas Pub. Comp.
- **Fundamentals of Artificial Neural Networks**, *M.A.Hassaoun.*
- **Fuzzy sets, uncertainty and information,** *George J. Kir, & TA Folger.*
- **Fuzzy sets, Decision making and Expert system**, *HJ Zimmerman*, Kluwer, Boston.
- **Fuzzy set theory and its applications**, *H. J. Zimmerman*, Kluwer, Boston.



MASTER OF SCIENCE IN INFORMATION TECHNOLOGY 2022-24

SCHEME OF TEACHING AND EXAMINATIONS

THIRD SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+ ((T+P) /2)	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Th	Ses	Pr	Total	Th	Ses	Pr	Total
M.Sc.(IT) 301	Java Programming Language	3	2	-	4	100	25	-	125	40	15	-	55
M.Sc.(IT) 302	Python Programming Language	3	2	-	4	100	25	-	125	40	15	-	55
M.Sc.(IT) 303	Advanced Computer Architecture	3	2	-	4	100	25	-	125	40	15	-	55
M.Sc.(IT) 304	**Electives III :** 1. Software Engineering 2. Digital Image Processing 3. Compiler Design	3	2	-	4	100	25	-	125	40	15	-	55
M.Sc.(IT) 305	**Electives IV :** 1. Mobile Communication 2. Analysis and Design of Algorithms 3. Computer Graphics	3	2	-	4	100	25	-	125	40	15	-	55
M.Sc.(IT) 306	**Lab-VII:** Programming in Java	-	-	3x2	3	-	50	100	150	-	30	50	**80**
M.Sc.(IT) 307	**Lab-VIII:** Programming in Python	-	-	2	1	-	50	50	100	-	30	25	55
M.Sc.(IT) 308	**Lab-IX**: Common Software/Mini-Project	-	-	2	1	-	50	50	100	-	30	25	55
M.Sc.(IT) 309	Seminar	-	-	2	1	-	25	-	25	-	15	-	15
	TOTAL	15	10	12	26	500	300	200	**1000**	200	180	100	**480**

THIRD SEMESTER : M.Sc.(IT)301
Java Programming Language

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Understand fundamentals structure and model of Java programming language.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Understand the basic principles of creating Java applications with graphical user interface (GUI).
- Student will be able to write a computer program to solve specified problems as well as make Business and research applications.

Syllabus

UNIT – I: Introduction to Java Programming

An overview of Java: Object Oriented Programming, Features of Java, Java Virtual Machine, Java Environment: Java Development Kit, Java Standard Library, Data Types, **Variables:** Declaring a variable, Dynamic Initialization, The scope and life time of variable, Type conversion and Casting: Narrowing and Widening Conversions, Numeric Promotions, Type Conversion Contexts; **Operators**: Arithmetic Operators, Relational Operators, Logical Operators, Bit wise Operators, Conditional Operators, new operator, [ ] and instance of operator. **Control Statements:** Java's Selection statement, Iteration Statement, Jump Statement. **Arrays**: Declaring Array variables, constructing an Array, Initializing an Array, Multidimensional Arrays, Anonymous Arrays.

UNIT – II: Classes and Interface

Introducing Classes: Class Fundamentals, Declaring Object, Assigning Object Reference Variables, Defining **Methods**: method overloading and overriding, Using objects as parameter, Constructors, Garbage collection, finalize () method. **Inheritance**: Inheritance basic, method overloading, object reference this and super, Chaining constructor using this () and super (), Member accessibility modifier: public, protected, default accessibility of member, private protected, private, **Package:** Define package, CLASSPATH, importing package, Interface: Define an interface, implementing interface, extending interface, variable in interface, **Overview of Nested Class:** Top level nested class and interface, Non static inner class, Local class, Anonymous class.

UNIT – III: Exception handling and Multithreading

Exception Handling: Exception types, Uncaught Exception, Using try and catch, multiple catch, nested try block, throw, throws, and finally. **Multithreading:** Creating Thread, Thread Priority, Synchronization, Thread Scheduler, Running & Yielding, Sleeping & Waking Up, Waiting & Notifying, Suspending & Resuming; miscellaneous methods in thread class.

UNIT – IV: Fundamental Library Classes of Java and Input / Output

Object class, String class, String Buffer class, Wrapper class, Math class, Collection: Collection interface, List interface, Set interface sorted interface, Array List class, Liked List class, Tree Set, Comparator, Vector, Stack. **I/O Classes and Interfaces:** File, Buffer Stream, Character Stream, and Random Access for files, Object Sterilization.

UNIT – V: Events, GUI and JDBC

Event Handling: Overview of Event Handling, Event Hierarchy, The Delegation Event Model, Event Classes, KeyEventClass, Sources of Events, Event Listener Interfaces, Using the Delegation Event Model, Event Adapters. **GUI Programming:** Introduction to Swing, History, Features, Components and Containers, Swing Packages, Painting, Swing Component Classes; **JDBC:** Introduction to JDBC, JDBC Drivers Type, Connection, JDBC URLs, Driver Manager, Statement – Creating, Executing, Closing, Result Set – Data Types and Conversions. Prepared Statement, Callable Statement, Mapping SQL and Java Types.

BOOKS RECOMMENDED:

- **Java: The Complete Reference,** *Herbert Schildt*, Oracle Press.
- **Core Java: Volume-I & Volume 2,** *Cay S. Horstmann & Gary Cornell*, PEARSON
- **Programming with Java,** *E. Balagurusamy*, McGraw Hill Education
- **Core Java**, *R. Nageshwara Rao*, Dreamtech Press

THIRD SEMESTER : M.Sc.(IT)302
Python Programming Language

Max Marks : 100 **Min Marks : 40**

Course Outcomes

At the end of course student will understand

- To understand why Python is a useful scripting language for developers and learn how to design and program Python applications.
- To learn how to use lists, tuples, dictionaries, indexing and slicing to access data in Python programs.
- To define the structure and components, how to write loops, decision statements, functions and pass arguments of a Python program.

Syllabus

UNIT – I

Introduction to Python Programming: What is a Program, Formal and Natural Languages, Why use Python, Uses of python, Strengths & Drawbacks, The Python Interpreter, Running Python, The IDLE User Interface, The Interactive Prompt, Script Mode, Dynamic Typing , Debugging. **Types, Operators, Expressions & Statements**: Values and Types, Assignment Statement, Variable Names, Expressions & Statements, Order of Operations, String Operations, Comments.

UNIT – II

Conditionals: Boolean Expressions, Logical operators, Conditional & Alternative Execution, Chained and Nested Conditions. **Iterations**: Reassignment, Updating Variables, The "for" and "while" statements, break. **Strings**: String is a sequence, len, Traversal with a for loop, String Slices, Searching, Looping and Counting, String Methods, the "in" operator, String Comparison.

UNIT – III

Lists: List is a Sequence, Traversing and other Operations, List Slices, List Methods, Map Filter and Reduce, Deleting Elements, Lists and Strings, Objects and Values, Aliasing, List Arguments. **Dictionaries:** A Mapping and as a Collection of Counters, Looping and Dictionaries, Reverse Lookup, Dictionaries and Lists, Memos, Global Variables. **Tuples:** Tuple Assignments, Tuples as Return Values, Variable Length Argument Tuples, Lists and Tuples, Dictionaries and Tuples, Sequence of Sequences.

UNIT – IV

Functions: Function Calls, Math Functions, Composition, Adding New Functions, Definitions & Uses, Flow of Execution, Parameters and Arguments, Why Functions, Stack Diagrams, Void and Fruitful Functions, Return Values, Incremental Development, Composition, Boolean Functions, Checking Types. **Recursion**: Stack Diagram for Recursive Functions, Infinite Recursion, Taking Input from Keyboard, More Recursion. Catching Exceptions

UNIT – V

Files: Files & Persistence, Reading and Writing, Filenames and Paths. **Object-Oriented Programming:** Programmer defined Types, Attributes, Instances as Return Values, Classes and Functions, Classes and Methods, Inheritance and Polymorphism. **Graphics programming**: Drawing with turtle graphics, using turtle module, moving the turtle with any direction, moving turtle to any location, the color, bgcolor, circle and speed method of turtle, drawing with colors, drawing basic shapes using iterations.

BOOKS RECOMMENDED:

- **Learning Python** 5th Edition, *Mark Lutz*, O'Reilly Publications
- **Core Python Programming**, *R. Nageshwara Rao*, Dreamtech Publications
- **Think Python** 2nd Edition, *Allen B. Downey*, O'Reilly Publications
- **Python Essentials Reference**, 4th Edition, *David M. Beazley*, Addison – Wesley
- **Practical Programming: An Introduction to Computer Science Using Python 3**, *Paul Gries et al.*, Pragmatic Programmer.

THIRD SEMESTER : M.Sc.(IT)303
Advanced Computer Architecture

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- To make the students aware about Parallel Computing.
- To apprise the students of the concepts of Multiprocessors, Multicomputer, Pipelining etc.
- To increase the employability.
- To open up new areas in the field of research and development in the area of computer architecture.

Syllabus

UNIT I:
Introduction - Feng's and Flynn's classification scheme-SISD, SIMD,MISD, MIMD Multiprocessor and Multicomputer, UMA, NUMA, COMA, NORMA, memory models, parallel computer and its type. Applications of Parallel Computers. Cache Coherence Protocols – Snoopy and Directory Protocols.

UNIT II:
System Interconnect Architecture – Static and Dynamic, Hypercube Interconnection network, multistage interconnection networks-architecture and routing, design consideration, throughput delay. Architecture and routing of 3 stage and 4 stage Banyan Network. Routing and Addition in Hypercube Interconnection network. Performance Metrics and Benchmarks.

UNIT III:
Principle of pipelining-overlapped parallelism, Linear and non-linear pipelining, reservation table, calculation of MAL.Types of Instruction Pipeline. Arithmetic pipeline designs example –Floating point adder, pipelined multiplier.

UNIT IV:
Advanced processor Technology – RISC, CISC, VLIW architectures, Hazard detection and resolution, functional organization of instruction in IBM 360/91. Numerical Problems based on CPI, IPC and MIPS.

UNIT V:
Exploring parallelism in program- Parallel Algorithm for Matrix addition and subtraction. Bitonic sort, sorting on linear array processors or odd even sort, PRAM algorithm for addition of numbers or Parallel Reduction. Bernstein's condition, ISO efficiency concept.

BOOKS RECOMMENDED:

- **Computer Architecture & Parallel Processing**, *Kai Hwang and F.A. Briggs*, McGraw Hill.
- **Advanced Computer Architecture**, *Kai Hwang*, McGraw Hill.
- **Parallel Computing**, *M.R. Bhujade*, New Age Publication.
- **Parallel Computing Theory and Practice**, *Michael J. Quinn*, Tata McGraw Hill

THIRD SEMESTER : M.Sc.(IT)304
Elective III: 1. Software Engineering

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- The student will have a fair idea about the importance of using software engineering principles in real life projects and also be able to pick an appropriate software development model for developing systems
- The student will be able to prepare software requirement sheet for a real life project, keeping in mind the properties of an SRS document
- The student will be able to use mathematical models for calculating the size, cost and duration of real life projects
- The student will be able to test the developed system using different testing techniques.
- Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.

Syllabus

UNIT – I: Software Engineering Fundamentals:
Introduction to Software Engineering; Software Engineering Principles(Layers); Software Process – Process Framework, Umbrella Activities, Process Adaptation; Software Crisis; Process Models-Waterfall Model, Prototype Model, Incremental Model, Spiral Model, RAD Model; Agile Process.

UNIT – II: Software Analysis and Design:
Requirement Engineering; Analysis Model-Data Flow Diagram, Data Dictionary, E-R Diagram, Decision Table; Software Requirements Specification(SRS), Structure of SRS; Pseudo code; Software Design; Design Process; Design Concepts-Abstraction, Partitioning, Modularity, Information Hiding, Refinement, Refactoring; Function Oriented Design; Object Oriented Design; Cohesion and Coupling.

UNIT – III: Software Quality and Case Tools:
Software Metrics, Categories of Metrics, Function Point Metric; Software Quality; McCall's Quality Factors; Software Maturity Model-CMM,CMMI; Software Quality Assurance; ISO Standards-9000, 9001 and 9126; Software Reliability; Case Tools and its Scope; Case Objectives; Architecture of Case Tools; Case Classification.

UNIT – IV: Coding and Testing:
Programming Style; Structured Programming; Coding Standard; Internal Documentation; Software Testing-Verification and Validation; Alpha and Beta Testing; Levels of Testing-Unit, Integration and System Testing; Testing Techniques-White Box, Black Box; Cyclomatic Complexity; Test Plan; Debugging-Debugging Process, Debugging Strategies(Approaches).

UNIT – V: Software Maintenance and Project Management:
Risk Management – Software Risk, Risk Identification; Introduction to Software Maintenance, Categories of Maintenance; Belady and Lehman Model; Boehm Model; Project Management Concept – People, Product, Process, Project; Software Team; Software Project Planning; Software Project Estimation; Cost Estimation Model(COCOMO, COCOMO II, Putnam-SLIM, Walston and Felix); Software Reengineering.

BOOKS RECOMENDED:

- **Software Engineering: A Practitioner's Approach**, *Roger S. Pressman*, TMH
- **An Integrated approach to Software Engineering**, *Pankaj Jalote*, Narosa Publications
- **Software Engineering**, *Bharat Bhushan Agarwal.*

THIRD SEMESTER : M.Sc.(IT)304
Elective III: 2. Digital Image Processing

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Review the fundamental concepts of a digital image processing system and analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration and categorize various compression techniques.
- Interpret Image compression standards, image segmentation and representation techniques.
- At the end student will come to know about the application area and use of image processing in different research area mostly in image diagnosis, medical.

Syllabus

Unit – I

Introduction: Digital Image Fundamentals Origins of Digital Image Processing, examples, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Image Sensing and acquisition Basic Concepts in Sampling and Quantization, Representing Digital Images, Zooming and Shrinking Digital Images, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

Unit – II

Image Enhancement Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods, **Frequency Domain**: Background, Image Enhancement in the Frequency Domain, Introduction to the Fourier Transform and the Frequency, Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering

Unit – III

Image Restoration A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering.

Unit – IV

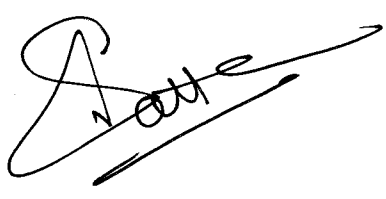
Image Compression: Fundamentals, Image Compression Models, Error-Free Compression, Lossy Compression, Image Compression Standards. **Morphological Image Processing**: Dilation and Erosion, Opening and Closing, Hit-or-Miss Transformations, Some Morphological Algorithms.

Unit – V

Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation. **Representation and Description:** Representation, Boundary Description and Regional Descriptor.

BOOKS RECOMMENDED:

- **Digital Image Processing**, *Rafel C Gonzalez and Richard E. Woods*, Pearson
- **Fundamentals of DIP**, *A.K. Jain*, PHI.
- **Digital Image Processing Using MATLAB**, *Gonzalez, Woods and Eddins, McGraw Hill Education*



THIRD SEMESTER : M.Sc.(IT)304
Elective III: 3.Compiler Design

Max Marks : 100 **Min Marks : 40**

Course Outcomes

- Students will be able to know about various phases of compiler design.
- Students will be aware of the function and complexity of modern compilers.
- Students will have a concrete view on the theoretical and practical aspects of compiler design
- Students will be able to apply ideas and techniques discussed to various software design.

Syllabus

UNIT - I

Introduction to Compiling and one pass compiler:
Compilers & translators, Phases of compilers, Compiler writing tools, Bootstrapping; overview of one pass compiler.

Finite Automata and Lexical Analysis:

Role of Lexical Analyzer; specification of tokens, Recognition of tokens, Regular expression, Finite automata, from regular expression to finite automata, DFA and NFA, Implementation of lexical analyzer; tools for lexical analyzer - LEX.

UNIT - II

Syntax analysis & Parsing Technique:
Context free grammars; Bottom up parsing, Shift reduce parsing, Operator Precedence parsing, Top down parsing, elimination of left recursion; recursive descent parsing, Predictive parsing.
Automatic Construction of Efficient parsers:
LR parser, construction of SLR and canonical LR parser table, Using ambiguous grammar, An automatic parser the generator, YACC, Using YACC with ambiguous grammar, creating YACC lexical analyzer with LEX, Error recovery in YACC.

UNIT - III

Syntax Directed Translation:
Syntax directed schema, Construction of syntax tree, Translation with top down parser.

Run Time Environment:
Source Language issues, Storage organization and allocation strategies, Parameter passing, Implementation of block-structured language.

UNIT - IV

Intermediate Code Generation:
Intermediate languages; Postfix notation, Three-address code, Quadruples and triples, Translation of assignment statements, Boolean expression, and Procedure call.

Error Detection & recover:
Lexical & syntactic phase error, semantics error.

UNIT - V

Code Optimization:
Optimization of basic block, Loop optimization global data flow analysis, Loop in variant computation. **Code Generation:** Issue and design of code generator, the target machine, a simple code generator.

BOOKS RECOMMENDED:

- **Principles of Compiler Designing** - Alfred V. Aho and J.D. Ullman.
- **Principles of Compiler-Principles, Technique and Tools** - Alfred V. Aho, Ravi Sethi

THIRD SEMESTER : M.Sc.(IT)305
Elective IV: 1. Mobile Communication

Max Marks : 100 **Min Marks : 40**

Course Outcomes

After completion of course student are able to:

- Understand the cellular concepts and infrastructure such as frequency reuse.
- Hand off and how interference between mobiles and base stations affects the capacity of cellular systems.
- Identify the technical aspects of wireless and mobile communications along with the knowledge about the wireless LAN, PAN, MANET and its routing protocol.
- Mobile Computing plays important role in research in wireless communication.

Syllabus

UNIT – I: Introduction.
Introduction to Mobile Communication, Short history of wireless communication, Applications, Vehicles, Emergency, Business, Replacement of wired network, Location dependent services, infotainment, Mobile and Wireless devices, A Simplified reference model, some open research topics in mobile communication.

UNIT – II: Satellite Systems
History of satellite system, Applications of satellite systems, Type of satellite systems, characteristics of satellite systems, satellite system infrastructure, satellite system architecture, Global Positioning system (GPS), Limitations of GPS. Beneficiaries of GPS, Applications of GPS

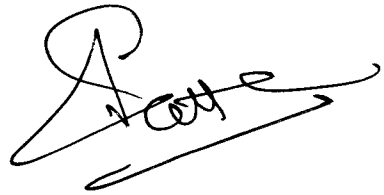
UNIT – III: Mobile Communication Systems
Introduction, Cellular System Infrastructure,, Registration, Handoff Parameters and Underlying support, Roaming Support Using System Backbone, to Mobile IP, Functions of Mobile IP, Mobile Node, Corresponding Node, Home Network, Foreign Network, Home Agent, Foreign Agent, Care-of Address, IP Packet Delivery, Agent Discovery, Agent Solicitation, Registration, Tunneling, Dynamic host configuration protocol.

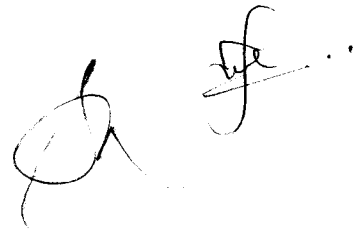
UNIT – IV: Wireless LANs and PANs
Introduction to IEEE 802.11, Ricochet, Ricochet Wireless Modem, Services Provided by Ricochet , Home RF, Home RF Technology, Hiper LAN, Blue tooth , Advantages and disadvantages of Wireless LAN, Infra red vs radio transmission , introduction to MAC. Technologies influence WLANs / WPANs in future.

UNIT – V: Mobile Adhoc Network
Introduction to Mobile Adhoc Network(MANET), Characteristics of MANET, Applications of MANET, Routing, Need for Routing, Routing Classification, Table-Driven Routing Protocol – Destination Sequenced Distance Vector Routing Protocol, Cluster-Head Gateway Switch Routing, Wireless Routing Protocol. Source initiated On-demand Routing- Adhoc on Demand Distance Vector Routing, Dynamic Source Routing, Temporarily Ordered Routing Algorithms, Hybrib Protocol – Zone Routing Protocol.

BOOKS RECOMMENDED:

- **Mobile Communication**: *Jochen H. Schiller*, Pearson Education Publication
- **Introduction to Wireless and Mobile Systems**: *D.P. Agrawal, Qing-An Zing*, Vikas Publishing House





THIRD SEMESTER : M.Sc.(IT)305
Elective IV: 2. Analysis and Design of Algorithm

Max Marks : 100 **Min Marks : 40**

Course Outcomes

After successful completion of this course, students should be able to:

- Prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
- Apply the algorithms and design techniques to solve problems.
- Analyze the complexities of various problems in different domains.

Syllabus

UNIT – I INTRODUCTION & ANALYSIS:
Analyzing algorithms, Algorithm types, Recurrence Equations, Growth function: Asymptotic notation, Standard notation & common functions, Recurrence relation, different methods of solution of recurrence equations with examples.

UNIT – II DYNAMIC PROGRAMMING & GREEDY PARADIGM:
The basic dynamic programming paradigm, Dynamic programming solution to the optimal matrix chain multiplication and the longest common subsequence problems, Top down recursive algorithms, Greedy Paradigm: The basic greedy strategy & computing minimum spanning trees, Algorithms of Kruskal and Prim, Union to Find Algorithm & their applications, Disjoint Set, The relationship in Dijkstra's and Prim's algorithms, Use of greedy strategy in algorithms for the Knapsack problem and Huffman trees.

UNIT – III DIVIDE AND CONQUER & BACKTRACKING PARADIGM:
Introduction to Divide and Conquer paradigm, Quick and merge sorting techniques, Linear time selection algorithm, the basic divide and conquer algorithm for matrix multiplication, Backtracking & Recursive backtracking, Applications of backtracking paradigm. heaps, Representation of heaps, Red Black tree, Binary Search tree , heap sort, shell & bucket sort, Amortized Analysis.

UNIT – IV GRAPH ALGORITHMS & STRING MATCHING ALGORITHMS:
Representational issues in graphs, Depth first search & Breath first search on graphs, Computation of biconnected components and strongly connected components using DFS, Topological sorting of nodes of an acyclic graph & applications, Shortest Path Algorithms on Graphs: Bellman-Ford algorithm, Dijkstra's algorithm & Analysis of Dijkstra's algorithm using heaps, Floyd-Warshall's all pairs shortest path algorithm and its refinement for computing the transitive closure of a graph.

UNIT – V NP-COMPLETE PROBLEMS:
Solvable problems, Types of problems, The notion of a non-deterministic algorithm and its basic relationship to backtracking. Polynomial time non deterministic algorithms for problems like satisfiability, clique problem, Hamiltonian path problems, The definition of NP-hardness and NP-completeness, The notion of polynomial transformation and reductions, Reductions to show that the clique problem, vertex cover, subset sum and Hamiltonian cycle problems are NP-complete.

BOOKS RECOMENDED:

- **Introduction to Algorithms**; *Cormen, Leiserson, Rivest, Stein*; PHI.
- **Fundamentals of Algorithms**, Horowitz and Sahni; Galgotia.
- **The Design & Analysis of Computer Algorithms**, *Hopcroft – Aho – Ullman*, AWL.
- **Handbook of Algorithms & Data Structures**, *G.H.Gonnet*, AWL.
- **Introduction to Design & Analysis of Algorithms**, *Levitin*, PE-LPE.

THIRD SEMESTER : M.Sc.(IT)305
Elective IV: 3. Computer Graphics

Max Marks : 100 **Min Marks : 40**

Course Outcomes

Upon successful completion of this course, student will be able to

- Understand the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two and three dimensions.
- Apply the concepts of colour models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
- Interpret the mathematical foundation of the concepts of computer graphics.

Syllabus

UNIT - I: Display Devices
Refresh Cathode-Ray tubes, Random Scan and Raster Scan Display, Color CRT Monitors, Color display techniques: shadow masking and Beam penetration, Direct view storage tubes, Flat Panel display: plasma panel displays, LED & LCD devices. **Interactive Graphics:** Physical Input devices, logical classification, input function, interactive picture construction techniques.

UNIT - II: Output Primitives
Points and Lines, Line drawing Algorithms: DDA Algorithm and Bresenham's Line Algorithm, Antialiasing. Circle generating Algorithms: Bresenham's Circle Algorithms, Midpoint Circle Algorithm, Ellipse Generating Algorithm: Midpoint, Character generation and text display. Output command for various geometrical shapes, Filled Area Primitive: Scan line polygon fill algorithm, Boundary fill algorithm, Flood fill algorithm. Attribute of outputs primitives: line attribute, Area-fill Attribute, Text attribute, Bundled attributes, Area-Fill.

UNIT -III:Two Dimensional Transformation and Viewing
Transformation: Translation, Scaling, Rotation, Reflection, Shearing. Matrix representations of Transformation and Homogenous Coordinates, Composite Transformations and Concatenation of transformation.**Two-Dimensional Viewing Coordinate system:** World/user coordinates, Device coordinate, Normalized device coordinates, Viewing pipeline: windows and viewports, Viewing transformation pipeling, Window-to-Viewport coordinate transformation, Clipping algorithm: point, line clipping algorithm: Cohen-Sutherland, Liang Barsky, Nicholl-Lee-Nicholl, Line Clipping, polygon clipping algorithm : Sutherland-Hodgman, Weiler-Atherton, text clipping.

UNIT - IV: 3-D Transformation and Viewing
3-D Transformation: Translation, Scaling, Rotation about standard and arbitrary axis, Other Transformation: Reflections and shears, Transformation commands. **Viewing:** Viewing Pipeline, Viewing Coordinates: transformation from world to viewing coordinates.

UNIT - V: 3-D Projection
Projection: Parallel Projection, Perspective Projection, Normalized view volume, viewport Clipping, Clipping in Homogeneous Coordinate. **Visible-Surface detection algorithms**: Back-Face removal, Depth Buffer method, Scan line method, Depth sorting method, Area subdivision and Octree method.

BOOKS RECOMMENDED:

- **Computer Graphics**, *Hearn D. & Baker P.M.*
- **Computer Graphics**: A Programming Approach, *Harrington S.*
- **Procedural Elements for Computer Graphics**, *Rogers D.F.*

MASTER OF SCIENCE IN INFORMATION TECHNOLOGY 2022-24

SCHEME OF TEACHING AND EXAMINATIONS

FOURTH SEMESTER

Subject Code	SUBJECTS	Teaching Load Per Week			Credit L+ (T+P)/2	Examination Marks							
						Max. Marks				Min. Marks			
		L	T	P		Sessional Marks of Project Work	Project Viva-Voce	Pr	Total	Sessional Marks of Project Work	Project Viva-Voce	Pr	Total
MSc(IT)401	System Development Project (System Design & Implementation)	-	-	30	15	200	200	-	400	120	100	-	220
	TOTAL	-	-	30	15	200	200	-	400	120	100	-	220

Note:

- Major Project may be a Research Project also.
- Participating in Workshops, Conferences and Seminars or publishing Research Papers will be given weightage in the research project.