NETAJI SUBHAS UNIVERSITY

SCHEME AND SYLLABUS

MCA

(Master of Computer Application)

(Effective from academic session: 2020-22)

NETAJI SUBHAS UNIVERSITY, JAMSHEDPUR

Course of Study (2020-2022)

Syllabus for Scheme for Master of Computer Application (MCA)

Note: Each paper in each semester is 30 marks for internal Exam and 70 marks for external Exam.

Total marks 100 for each paper.

1ST YEAR			
1ST SEM		**2ND SEM**	
Paper-Code	**Paper Name**	**Paper-code**	**Paper Name**
MCA – 101	Computer Organization	**MCA – 201**	Web Design
MCA – 102	Operating System	**MCA – 202**	System Analysis and Design
MCA – 103	C language	**MCA – 203**	OOPS using C++
MCA – 104	Discrete Mathematics	**MCA – 204**	Statistics and Numerical Analysis
MCA – 105	Data Structure using C	**MCA – 205**	Database Management System
LAB – 101	C programming LAB	**LAB – 201**	DBMS LAB
LAB – 102	Data structure LAB	**LAB – 202**	C++ LAB
2ND YEAR			
3RD SEM		**4TH SEM**	
MCA -- 301	Computer Graphics	**MCA -- 401**	Web Technology
MCA -- 302	Java Programming	**MCA -- 402**	Introduction to python
MCA -- 303	Computer Networking	**LAB -- 401**	WT LAB
MCA -- 304	Elective - 1	**LAB -- 402**	Python LAB
MCA -- 305	Elective - 2	**PROJ – 001**	PROJECT
LAB -- 301	CG Lab		
LAB – 302	JAVA Lab		

Elective001

E1-Data Warehousing and data mining

E2-Cloud Computing

E3-Multimedia

Elective002

E4-Artificial Intelligence

E5-Distributed Database Management

E6-Cryptography and Network Security

PROGRAM OUTCOMES:

1. Apply knowledge of Computing fundamentals, Computing specialization, Mathematics and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

2. Identify, formulate, research literature, and solve complex Computing problems reaching substantiated conclusions using fundamental principles of Mathematics, Computing sciences, and relevant domain disciplines.

3. Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

4. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

5. Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

6. Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

7. Recognize the need, and have the ability, to engage in independent learning for continual development as a Computing professional.

8. Demonstrate knowledge and understanding of computing and management.

Principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

9. Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

10. Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

11. Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

12. Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Semester I

Course Name: Computer Organization

Course Code: 101

PROGRAM SPECIFIC OUTCOMES:

- ➢ Understand the basics of instructions sets and their impact on processor design
- ➢ Demonstrate an understanding of the design of the functional units of a digital computer system.
- ➢ Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- ➢ Design a pipeline for consistent execution of instructions with minimum hazards.
- ➢ Manipulate representations of numbers stored in digital computers.

Course Objectives:

1. Understanding of digital system, its organization and architecture.
2. Apply knowledge of digital electronics logic gate to combinational and sequential circuits.
3. Knowledge of the basics of computer hardware and how software interacts with computer hardware.
4. Apply concepts of assembly language in solving problems.
5. Illustrate the concept of processing I/O organization and examine different ways of communicating with I/O devices and standard I/O interfaces.

Syllabus:

Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

Boolean Algebra and Logic Gates: Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operating, Digital Logic Operations, Digital Logic Gates, Integrated Circuits. Gate - Level Minimization: The Map Method, Four - Variable Map, Five – Variable Map, Product of Sums Simplification, Don't - Care Conditions, NAND and NOR Implementations, Other Two- Level Implements, Exclusive - OR Function. Combinational Logic: Combinational Circuits? Analysis Procedure, Design Procedure, Binary Adder – Substractor, Decimal Adder, Binary Multiplier,

Magnitude Comparator, Decoders, Encoders, Multiplexers Synchronous Sequential Logic: Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure.

Registers and Circuits: Registers, Shift Registers, Ripple Counters, Synchronous Counters and Other Counters.

Memory and Programmable Logic: Introduction, Random-Access Memory, Memory Decoding, Error Detection and Correction, Read-Only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.

Text Books:
1.Computer System Architecture, Morris Mano, PHI
2.Computer Organization, Hamacher, MGH
3. Computer Architecture, Carter, Schaum Outline Series, TMH
4.System Architecture, Buad, VIKAS
5.The Fundamentals of Computer Organization, Raja Rao, Scitech
6.Computer Organization & Design, Pal Chowdhury, PHI

Course Name :Operating System

Course Code : 102

PROGRAM SPECIFIC OUTCOMES:

- ➢ Explain main components, services, types and structure of Operating Systems.
- ➢ Apply the various algorithms and techniques to handle the various concurrency control issues.
- ➢ Compare and apply various CPU scheduling algorithms for process execution.
- ➢ Identify occurrence of deadlock and describe ways to handle it.
- ➢ Explain and apply various memory, I/O and disk management techniques.

Course Objectives:

1. Able to learn working and type of operating systems, its process management, process synchronization, deadlocks, memory management.
2. Able to analyze and write algorithms for disk, process and memory management.
3. Understand concepts of file system, directory structures, distributed file system and embedded operating system.

Syllabus:

Importance of OS, Basic concepts and terminology, types of OS, different views, journey of a command execution, design and implementation of OS. Process: Concept and views, OS view of processes, OS services for process management, scheduling algorithms, performance evaluation; Inter process communication and synchronization, mutual exclusion, semaphores, hardware support for mutual exclusion ,queuing implementation of semaphores, classical problem of concurrent programming, critical region and conditional critical region, monitors, messages, deadlocks.

Resource manager, file management, processor management, device management, Memory management – paging, swapping, page replacement algorithm, design issues for paging system, segmentation, Scheduling algorithm and performance evaluation Security and protection, policies and mechanism, authentication, protection and access control, formal models of protection, cryptography, worms and viruses.

In-process communication & synchronization, File systems, security and protection mechanism, Input/output systems, processes and processors in distributed system Performance measurement, monitoring and evaluation Multiprocessor system, classification and types, OS functions and requirements, introduction to parallel computing, multiprocessor interconnection synchronization. Distributes OS - rationales, algorithms for distributed processing.

Introduction to compilers, Assemblers, loaders & linkers, Introduction to OS, OS services and kernel, Multiprogramming and time sharing, Processor scheduling Performance measurement and monitoring – measures, evaluation techniques, bottlenecks and saturation, feedback loops.
Introduction to Unix OS

Text Books:
1. Operating Systems, Galvin &Silverschatz, John Wiley
2.Operating Systems, Milenkovic, TMH
3.Modern Operating System, 2nd Ed, Tannenbaum, PHI
4.Systems Programming & Operating Systems, Dhamdhere, TMH
5. Systems Programming, Donovan, TMH
6.Guide to Operating Systems, Palmer,VIKAS
7.Operating Systems,Prasad,Scitech
8.Operating System ,P.Bhatt, PHI

Course Name : C Language

Course Code : 103

PROGRAM SPECIFIC OUTCOMES:

- ➢ To learn the basics of different types of programming.
- ➢ To understand the syntax and building blocks of the C- program.
- ➢ To learn to solve a problem using the C-Program.
- ➢ To compile and debug a C- Program.
- ➢ To generate an executable file from program.

Course Objectives:

1. Learn the basic and introduction of computer, structure of c and Control structure.
2. Know arrays, arrays types, string handling functions.
3. Understand user defined functions, categories of function and recursion, structures and unions.
4. Know the concept pointers, fire handling, input output operations.
5. Able to use the classification of data structure about abstract data type, stack and queue.

Syllabus:

Overview of C
Constants, variables & data types
Operators and expressions
Managing input and output operators
Decision-making and branching/Looping.
Arrays, handling of character Strings.
User-defined functions
Structures and unions
Pointers, file management in C
Dynamic memory allocations in relation to array (Use malloc(), calloc(), realloc(), free())
Overview of Pre-processor statements.
Program through Command Line Arguments

Books:
1.Programming with C, Gottfried, TMH
2.C The Complete Reference, Schildt, TMH
3.Practical C Programming,3rdEd,Oualline,SPD/O'REILLY

4.A First Course in programming with C, Jeyapoovan, VIKAS
5.The C answer Book, Tondo,2nd Ed, PHI
6.C Programming Made Easy, Raja Ram, SCITECH
7.Projects Using C, Varalaxmi,SCITECH
8.Mastering Algorithms With C,Loudan, SPD/O'REILLY

Course Name :Discrete Mathematics

Course Code : 104

PROGRAM SPECIFIC OUTCOMES:

- ➢ Be familiar with constructing proofs.
- ➢ Be familiar with elementary formal logic.
- ➢ Be familiar with set algebra.
- ➢ Be familiar with combinatorial analysis.
- ➢ Be familiar with recurrence relations.
- ➢ Be familiar with graphs and trees, relations and functions, and finite automata.
- ➢ Be exposed to the strategies for compare relative efficiency of algorithms.

Course Objectives:

1. Prepare to develop mathematical logic essentially required in complex programming.
2. Able to learn and apply settheory, algebraic structures,lattices and Boolean algebra, graph theory.
3. Able to troubleshoot fault detection in combinational switching circuits.
4. Understandand able to apply learns to analyse algorithms for generating a fault matrix.

Syllabus:

Set Theory foundation mapping (bijective, surjective, injective), Relations-equivalence, Poset, Lattice
Mathematical Induction, Propositional logic, Logical equivalence. Permutation and
combinations.Generating functions, Recurrence relations.
Concepts of Graph Theory, sub-graphs, cyclic graphs.
Trees, spanning trees, binary trees.
Algorithms- Kruskal's , Prim's , Dijkstra's , Flyod's ,Warshall's, DFS, BFS.
Isomorphism, Homomorphism of Graphs.

Finite automata – Construction & Conversion of NFA, DFA, State minimization, Mealy
M/C, Moore M/C.
Definition Of Grammars – Type 0,1,2,3.
Fuzzy sets – basic properties

Books:
1.Theory of Computer Science, Mishra &Chandrasekharan, PHI

2.Discrete Mathematics for Comp. Scientists & Mathematicians, Mott, Kandel& Baker, PHI

3.Discrete Mathematical Structure, C.L.Liu,TMH

4.Discrete Mathematical Structure, G.S.RAO,New Age International

5.Discrete Mathematics With Applications, Rosen, TMH, 5th Ed

Course Name :Data Structure using C

Course Code : 105

PROGRAM SPECIFIC OUTCOMES:

➢ Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms.
➢ Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.
➢ Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.
➢ Demonstrate different methods for traversing trees.
➢ Compare alternative implementations of data structures with respect to performance.
➢ Compare and contrast the benefits of dynamic and static data structures implementations.
➢ Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack.
➢ Design and implement an appropriate hashing function for an application.
➢ Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.

Course Objectives:

1. Knowledge of basic data structures and algorithms.
2. Understand concepts of searching and sorting techniques
3. Understand concepts of stacks, queues, lists, trees and graphs.
4. Able to write algorithms for solving problems with the help of fundamental data structures

Syllabus:

Algorithm concept, Complexity – Big O-Notation, time space trade-off.
Array- Row/Column major representation, sparse matrix, shifting. Linked List- Singly, circular, doubly, doubly & circular.
Stack- Push, Pop, Conversion from infix – to postfix, evaluation of postfix expression. Stack representation using array & linked list.
Queue – insert, delete, representation using array & linked list, circular queue (operations), dequeue (operations),priority queue(operations)-Both iterative & recursive implementation.
Garbage collection-different techniques.
Tree- definition – traversal algorithms (pre, post, in).Threaded tree (One Way & Two Way), heap tree, Avl tree-balancing, B-tree Binary search tree, Huffman algorithm, Creation of Heap.
Sorting with complexity analysis – bubble, merge, quick, selection, insertion, shell, Tournament, radix, heap .

Search- Linear & Binary (Complexity Analysis).

Recursion Technique- overview including tail recursion.

Hashing- definition. Functions- Mid square, Folding, remainder, Collision resolution &Linear probing.

Overview On – Sequential file, random access file, indexed sequential, hash file.

Pattern matching algorithms- Brute force, Knuth-Morris-Pratt.

Books:

1.Data Structure Using C, Ajay Agarwal, Cyber Tech

2.Data Structure Using C, Radhakrishnan&Shrinivasan, ISTE/EXCEL

3.C and Data Structures,Radhaganesan,Scitech

4.Data Structure Using C & C++, Tannenbaum, PHI

5.Data Structures & Program Design in C,2nd Ed, Kruse, Tondo& Leung, PHI

6. Mastering Algorithms With C,Loudan, SPD/O'REILLY

Course Name :Web Design

Course Code : 201

PROGRAM SPECIFIC OUTCOMES:

- ➢ On completion of this course, a student will be familiar with client server architecture and able to develop a web application using web technologies. : ded for entry.
- ➢ Students will gain the skills and project based experience nee Course Outcomes into web application and development careers.
- ➢ Students are able to develop a dynamic webpage by the use of java script and DHTML. Students will be able to write a well formed / valid XML document. Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- ➢ Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
- ➢ The course is intended for those who have never done anything with HTML or web pages (static and dynamic), and would like to build this basic knowledge for starting a career as a web developer or for learning how to program HTML for web pages HTML/ HTML5, CSS, JavaScript, VB Script.
- ➢ Web development strategies using server side programming with ASP, JSP, Com/D-Com, PHP and at the end of the course you'll gain knowledge about where to go next to further your front-end web development skills.

Course Objectives:

- Understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
- Become familiar with graphic design principles that relate to web design and learn how to implement theories into practice.
- Develop skills in analyzing the usability of a web site.
- Understand how to plan and conduct user research related to web usability.
- Learn the language of the web: HTML and CSS.
- Learn CSS grid layout and flexbox.
- Learn techniques of responsive web design, including media queries.
- Develop skills in digital imaging (Adobe Photoshop.)
- Develop basic programming skills using Javascript and jQuery.
- Be able to embed social media content into web pages.

Syllabus:

Introduction to Web Engineering: Categories and Characteristics of Web Applications, The Internet, Basic Internet Protocols, Introduction to Intranet, Client-Server Environment, Web Browser and its functions, Web Servers and their features, WWW.

Types of Computer Network: LAN, WAN, MAN, Network Topologies. E-Mail Concepts: Sending and Receiving Files through E-Mail, Fighting Spam, Sorting and Searching Mails, Mailing List, Avoiding E-Mail viruses, Configuring E-Mail Program.

Search Engines: Categories of Search Engines, Searching Criterion, Hypertext Transfer Protocol (HTTP), URL and DNS working, Usenet Newsgroup Concepts: Reading Usenet newsgroups, Internet Relay Chat.

Introduction to Blog: Using Wordpress, Introduction to social networking: Instant messaging, Web-Based chat rooms and discussion boards, Voice and Video conferencing, Streamlining Browsing, Keeping track of Favorite Web Sites, Web Security: Privacy and Site-Blocking.

Web designing using HTML: Understanding HTML, XHTML Syntax and Semantics, HTML Elements: Paragraph, Lists, Tables, Images, Frames, Forms, Linking to other Web Pages: External and Internal linking, E-mail Links, Working with Background colors and Images, Marquee, Text Alignment and Text Formatting, Advanced Layout with Tables; Publishing HTML Pages.

Books:
1. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. Satish Jain: "O" – Level Information Technology.
3. AchyutGodbole, "Web Technologies", Tata McGraw Hill, India.
4. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
5. V.K. Jain: "O" – Level Information Technology, BPB Publications.
6. Gill Nasib Singh: Essentials of Computer and Network Technology, Khanna Books Publishing Co., New Delhi.

Course Name :System Analysis and Design

Course Code : 202

PROGRAM SPECIFIC OUTCOMES:

➢ Define various systems analysis and design concepts and terminologies,
➢ Describe the stages of the system development life cycle model,
➢ Describe different methodologies and state-of-the-art developments in SA&D techniques and methods,
➢ Compare, use and synthesize different conceptual modelling techniques for systems analysis (including ERDs, DFDs and UML)
➢ Address the managerial issues involved in SA&D,

Course Objectives:

• Understand different phases of Systems Development lifecycle.
• Understand how projects are initiated and selected, define a business problem and determine the feasibility of a proposed project.
• Apply information gathering methods effectively to elicithuman information requirement.
• UnderstandprototypinganddeveloplogicalDFD'sthatillustratetheproposed system.
• Create data dictionary and choose an appropriate decision analysis method for analyzing structured decision and creating process specification.
Design input-output for user interface and database for storing data.

Syllabus:

Overview of System analysis and design: Development life cycle, Requirements determination, Logical design, Physical design, Program design, Risk and feasibility analysis, SRS, prototyping. Information requirement analysis: Process modeling with physical and logical data flow diagrams, Data modeling with entity relationship diagrams, Addition modeling method, Developing proposal: feasibility studies, cost benefit analysis.

System design: Process descriptions, Input/output controls, object modeling, Database design, and User Interface design, Documentation.

Introduction to - Project management, scheduling, measurement of quality and productivity, ISO and capability maturity models, Strategic planning, system audit.

Quality assurance: reviews, walkthroughs, and inspection.

Books:
1. Analysis & Design of Information Systems, Senn,MH.
2. Information Systems:Analysis& Design, Ram Bansal 'Vigyacharya',New Age International
3. Analysis, Design of Information System, Rajaraman, PHI
4. System Analysis &Design, Parthasarathi,EPH
5. System Analysis, Design & MIS, EXCEL BOOKS
6. Analysis, Design & implementation of Information Systems, Sharma, VIKAS
7. System Analysis & Design Hand Book, V.K. Jain, Wiley Dreamtech

Course Name :OOPS using C++

Course Code : 203

PROGRAM SPECIFIC OUTCOMES:

- Differentiate between object oriented programming and procedure oriented programming & Disseminate the importance of Object oriented programming.
- Apply C++ features such as Classes, objects, constructors, destructors, inheritance, operator overloading, and Polymorphism, Template and exception handling in program design and implementation.
- Use C++ to demonstrate practical experience in developing object-oriented solutions.
- Analyze a problem description and build object-oriented software using good coding practices and techniques.
- Implement an achievable practical application and analyze issues related to object-oriented techniques in the C++ programming language.

Course Objectives:

- Understanding of Object oriented programming and advanced C++ concepts.
- Use C++Concepts for solving real life problems.
- Develop problem solving skills using object oriented techniques.

Syllabus:

Basics of Object Oriented programming and software design
C++ object-oriented programming, C++ & ANSI standard C, Predefined classes in C++
Building objects with classes, Defining operations on objects, Using Inheritance in C++
Virtual functions and Polymorphism
Function overloading, Operator Overloading
Constructor, Constructor overloading, Destructor, Friend Function.
Overview of File Handling, streams
Advanced Topics in C++ - Overview of Template (Class & Functions).
Exception Handling.

Books:
1. Object-Oriented Programming With C++, Balagurusamy, TMH
2.Object Oriented Programming & C++,R.Rajaram,New Age International
3.C++ The Complete Reference, Schildt, 4th Ed, TMH
4.Programming in C++, Shah &Thaker, ISTE/EXCEL

5.Beginning C++, The Complete Language, Horton,SPD/WROX
6. Object-Oriented Programming With C++, Suburaj, VIKAS

Course Name :Statistics and Numerical Analysis

Course Code : 204

PROGRAM SPECIFIC OUTCOMES:

- ➢ Understand the various approaches dealing the data using theory of probability.
- ➢ Analyze the different samples of data at different level of significance using various hypothesis testing. Develop a framework for estimating and predicting the different sample of data for handling the uncertainties.
- ➢ Understand error, source of error and its affect on any numerical computation and also analyzing the efficiency of any numerical algorithm.
- ➢ Learn how to obtain numerical solution of nonlinear equations using Bisection, Newton – Raphson and fixed-point iteration methods. Solve system of linear equations numerically using direct and iterative methods.
- ➢ Understand the methods to construct interpolating polynomials with practical exposure.

Course Objectives:

The main objective of this course is to understand and implement various concepts of numerical analysis and statistics to solve real life problems.

Syllabus:

Basic Statistics-measure of central tendency, dispersion, Probability, distribution.introduction to mass function, density function, distribution function (Binomial, Poisson,Normal), estimation of parameters (unbiasedness-concept of noise/error, consistency)
Interpolation-Newtons Forward, Backward, Sterling & Bessel's Interpolation formula, Lagrange's Interpolation .
Integration- Trapezoidal, Simpson's 1/3 rd, Weddel's Rule, Romberg Integration, Gauss- Legendre two & three point formula, Newton Cotes Formula.
Gram-Schmidt orthogonalisation, Tchebycheff polynomial Solution of transcendental equations-Method of Iteration, Method of Bisection, Newton - Raphson Method, Regula-Falsi method, Secant Method.
Solution of system of linear equations- Gauss Elimination Method, Gauss-Jacobi, Gauss- Seidel, LU factorisation, Tri-diagonalisation. Inverse Interpolation.

Least Square Curve fitting- linear & non-linear
Solution of Differential Equations- Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.

Books:

1.Numerical Analysis, Shastri, PHI
2.Numerical Analysis, S. Ali Mollah
3.Numerical Analysis, James B. Scarbarough
4. .Numerical Methods for Mathematics ,Science&Engg., Mathews, PHI
5.NumericalAnalysis,G.S.Rao,New Age International
6.Programmed Statistics (Questions – Answers),G.S.Rao,New Age International
7.Numerical Analysis & Algorithms, PradeepNiyogi, TMH
8.Computer Oriented Numerical Mathematics, N. Dutta, VIKAS
9.NumericalMethods,Arumugam,Scitech
10.Probability and Statisics for Engineers,Rao,Scitech
11.Numerical Methods in Computer Application,Wayse,EPH

Course Name :Database Management System

Course Code : 205

PROGRAM SPECIFIC OUTCOMES:

- ➢ Use the Concept of Database.
- ➢ Write SQL commands to query a database.
- ➢ Write PL/SQL programs for implementing stored procedures.
- ➢ Write PL/SQL programs for stored functions, cursors, trigger and packages.
- ➢ Know backend process of data in applications.

Course Objectives:

- Define Database Management System, explain fundamental elements of a database management system, compare the basic concepts of relational data model, entity relationship model.

- Design entity-relationship diagrams to represent simple database application scenarios, translate entity-relationship diagrams into relational tables, populate are lational database and formulate SQL queries on the data.

- Understand the basic concepts regarding database, know about query processing and techniques involved in query optimization and understand the concepts of database transaction and related database facilities including concurrency control, backup and recovery.
- Analyze a database design and improve the design by normalization.
- Choose efficient query optimization techniques, select suitable transaction management, concurrency control mechanism and Recovery management techniques.
- Explain File organization and use appropriate index structure.
- Create and maintain tables using PL/SQL queries.
- Design and implement a database schema for a given problem-domain
- Prepare reports.
- Applyandcreatedifferenttransactionprocessingandconcurrencycontrol applications.
- Application development using PL/SQL& front end tools.

Syllabus:

Distributed DBMS features and needs.Reference architecture.Levels of distribution transparency, replication.Distributed database design – fragmentation, allocation criteria.

Storage mechanisms.Translation of global queries. / Global query optimisation. Query execution and access plan. Concurrency control – 2 phases locks. Distributed deadlocks.
Time based and quorum based protocols. Comparison.Reliability- non-blocking commitment protocols.Partitioned networks. Checkpoints and cold starts. Management of distributed transactions- 2 phase unit protocols. Architectural aspects.Node and link failure recoveries.

Distributed data dictionary management.Distributed database administration. Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled.

Alternative architecture. Development tasks, Operation- global task management. Client server databases-SQL server, open database connectivity.Constructing an application.

Books:
1. Database System Concepts, SilberschatzKorth, Sudarshan, MH
2. Database Management Systems,Ramakrishnan, MH
3. Beginning SQL Server 2000 programming, Dewson,SPD/WROX
4. Database Management Systems, Leon, VIKAS
5. My SQL :Enterprise Solutions, AlexenderPachev, Wiley Dreamtech

Course Name :Computer Graphics

Course Code :301

PROGRAM SPECIFIC OUTCOMES:

- ➤ Understand the basics of computer graphics, various graphics systems and applications of computer graphics.
- ➤ Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
- ➤ Use of geometric transformations on graphics objects and their application in composite form.
- ➤ Extract scene with different clipping methods and its transformation to graphics display device.
- ➤ Explore projections and visible surface detection techniquesfordisplayof3D scene on 2D screen.
- ➤ Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

Course Objectives:

- • To know the foundations & Core Concepts of computer graphics.
- • To comprehend the concept of geometric, mathematical and algorithmic concepts necessary for understanding computer graphics.
- • To understand the comprehension of windows, clipping and view-ports object representation in relation to images displayed on screen.
- • To understand the concepts of Output primitives, 2D-transformations,2D-Viewing,Structural&HierarchicalModeling.
- • To Understand the concepts of GUI & input methods,
- • To understand the concept of 3D , object representation in 3D,3DTransformation &Viewing.
- • To familiarize the students with graphics concepts like clipping, splines, objects modeling, visible surface detection.

Syllabus:

Application of Computer Graphics, Graphics Devices, Cathode Ray Tube, Raster Scanning, Raster Refresh graphics displays.
Graphics Operations –2D & 3D Graphics, Bezier, B-Spline, Hermite, Bresenham Line & Circle Drawing Algorithms, Polygon filling, Edge Filling Algorithms. Clipping—Cohen-Sutherland subdivision line clipping algorithm, Mid-Point subdivision algorithm, 2-dimensional clipping algorithm (Convex

Boundaries & Partially visible lines), Cyrus-Beck algorithm for Partially & Totally Visible Lines) , Visible Surfaces- Floating Horizon Algo. ,Upper & Lower Horizon, Roberts algo, Warnock algo, Scan-line Z-buffer algo. Rendering- introduction (illumination models), shading- Gouraud Shading, Phong Shading. Shadowing- Shadow Algorithms.

Introduction to GKS.Multimedia, concepts, design, hardware, standards – MPEG, JPEG, MIDI, multimedia design methodology, development and testing.

Books:

1. Computer Graphics,2ndEd.,Hearn&Baker,PHI
2.Porcedural& Mathematical Elements in Computer Graphics, Rogers,TMH
3.ComputerGraphics,Plastock,, Schaum Outline Series, TMH
4.EngineeringGraphics,K.Venugopal,New Age International
5.Computer Graphics, EXCEL BOOKS
6.Introduction to Computer Graphics, A. Mukherjee, VIKAS
7. Fundamentals of Computer Graphics & Multimedia,Mukherjee,PHI
8.Computer Graphics, Bhandari & Joshi , EPH

Course Name : JAVA Programming

Course Code : 302

PROGRAM SPECIFIC OUTCOMES:

- ➢ Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
- ➢ Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
- ➢ Understand object, garbage collection, classes and interfaces.
- ➢ Understand the principles of inheritance, packages and interfaces.
- ➢ Demonstrate the concepts of polymorphism and inheritance Demonstrate.

Course Objectives:

- ➢ To understand the basic concepts and fundamentals of platform independent object oriented language.
- ➢ To demonstrate skills in writing programs using exception handling techniques and multithreading.
- ➢ To understand streams and efficient user interface design techniques.

Syllabus:

An overview of Java

Data Types - variables and arrays

Operators, Control statements
Classes and objects, Inheritance, String and string buffer, Packages, Interfaces, Exception Handling , Multithreaded Programming, Applets, Event handling
Abstract Window Toolkit
JDBC and ODBC

Books:
1. Object Oriented Programming with JAVA, Wu,TMH
2. Beginning JAVA 2 :SDK 1.4,Horton,SPD/WROX
3. JAVA 2: The Complete Reference, Schildt, TMH
4. Programming in JAVA, EXCEL BOOKS
5. Object Oriented Programming with C++ &Java,Samanta,PHI

6. Object Oriented Application, Development using JAVA,Doke, VIKAS
7. Programming with Java 2,Xavier, Scitech
8.Projects on Java 2, Xavier, Scitech

Course Name :Computer Networking

Course Code : 303

PROGRAM SPECIFIC OUTCOMES:

➢ Describe communication models TCP/IP, ISO-OSI model, network topologies along with communicating devices and connecting media.
➢ Apply knowledge of error detection, correction and learn concepts of flow control along with error control.
➢ Classify various IP addressing techniques, subnetting along with network routing protocols and algorithms.
➢ Understand various transport layer protocols and their design considerations along with congestion control to maintain Quality of Service.
➢ Understand applications-layer protocols and elementary standards of cryptography and network security.

Course Objectives:

➢ Describe communication models TCP/IP, ISO-OSI model, network topologies along with communicating devices and connecting media.
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➢ Classify various IP addressing techniques, subnetting along with network routing protocols and algorithms.
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➢ Understand applications-layer protocols and elementary standards of cryptography and network security.

Syllabus:

Introduction to computer network- Topology; Base Band & Broad Band Topology;Guided& Unguided Media. Overview of Data & Signal Bits. Baud & Bit Rate.Modulation (AM, PM, FM); Multiplexing (TDM, FDM, STDM).
Encoding (RZ, NRZ, BIPLOAR, MANCHESTER, DIFF. MANCHESTER). Digital To Analog – ASK, PSK, FSK, QPSK.
Transmission methods – Synchronous & Asynchronous, Flow Control, Error Control, Error Detection methods.

Goals of Layered protocols- Introduction to OSI, TCP/IP, IBM, SNA, ATM.

Bit oriented (BSC) & Character oriented Protocol (SDLC, LAPB, LAPD, LLC)

HDLC- frame format, station, states, configuration, access control.

LAN Topology – Ethernet (IEEE 802.3), Token Bus (IEEE 802.4), Token Ring (IEEE 802.5)

Introduction to WAN – DQDB (IEEE 802.6) & FDDI.Switching Technologies – Circuit, Message, and Packet.

X.25, X.21, RS-232 C – frame format, channel, packet frames, facilities (In brief Only).

ISDN- D channel, B-Channel, International Standards, NT1, NT2, TA, TE Devices.

Introduction to leased lines, DSL, Digital Carriers. Bridging & Routing – Static & Dynamic (In Brief).

IP, IP addressing, ICMP, ARP,RARP.

Congestion Control, TCP, UDP.

HTTP,FTP,Telnet,SMTP.

Introduction to data security (private key, public key, ISO standards).

Introduction to Mobile technology (Topology, FDM, TDM, CDMA), Satellite Communication (LEO, GEO, TDM).

Books:

1.Data Communication & Networking, Forouzan, TMH

2.Computer Networks, Tannenbaum, PHI

3.Data& Computer Communications, Stallings,PHI

4.Comminication Networks, Walrand, TMH

5.Computer Communication Networks, Shanmugam& Rajeev, ISTE/EXCEL

6.DataCommunications,Prakash C. Gupta, PHI

7.Computer Networking, Tittel, Schaum Outline Series, TMH

Course Name : Web Technologies

Course Code : 401

PROGRAM SPECIFIC OUTCOMES:

- ➢ Develop static web pages using HTML.
- ➢ Develop Java programs for window/web-based applications.
- ➢ Design dynamic web pages using Javascript and XML.
- ➢ Design dynamic web page using server site programming Ex. ASP/JSP/PHP.
- ➢ Design server site applications using JDDC,ODBC and section tracking API.

Course Objectives:

- ➢ Introduce students to web technologies such as HTML, CSS, XML, PHP Teach them to create static and simple dynamic web pages or applications using these technologies
- ➢ Understand web application deployment and software architectures
- ➢ Students will learn basic web application design, development and testing skills.

Syllabus:

Introduction to HTML: HTML, HTML Tags, Commonly Used HTML Commands, Titleand Footers, Text Formatting, Text Style, Lists, Adding Graphics to HTMLDocuments, Tables, Linking Documents, and Frames.

Java Script: Java Script in Web Pages, Advantages of Java Script, Advantages ofJava Script, Data Types and Literals, Type Casting, Java Script Array, Operatorsand Expression, Conditional Checking, Function, User Defined Function.
Understanding XML: SGML, XML, XML and HTML, Modeling XML Data, Styling XMLwith XSL, XHTML
Creation of Dynamic Web pages using JSP: Dynamic Web Page, Introduction of JSP, Pages Overview, JSP Scripting, Standard Action, Page Directive, Include Directive

Books:
1. Ivan Bay Ross- Web Enable Commercial Application Using HTML, DHTML, BPB Publication
2. Michel Morrison -HTML and XML for Beginners, PHI, New Delhi- 2001
3. H.M Dietal and P.J Dietal -Java How to Program, PHI, New Delhi- 2005

Course Name :Introduction to Python

Course Code : 402

PROGRAM SPECIFIC OUTCOMES:

- ➢ Understand and comprehend the basics of python programming.
- ➢ Apply knowledge in real time applications.
- ➢ Understands about files and its applications.

Course Objectives:

- ➢ Familiar with Python environment, data types, operators used in Python.
- ➢ Compare and contrast Python with other programming languages.
- ➢ Learn the use of control structures and numerous native data types with their Methods.
- ➢ Design user defined functions, modules, and packages and exception handling Methods.
- ➢ Create and handle files in Python and learn Object Oriented Programming Concepts.

Syllabus:

Introduction to Python Programming Why do we need Python Program structure in Python Execution steps Interactive Shell Executable or script files. User Interface or IDE

 Memory management and Garbage collections Object creation and deletion Object properties Data Types and Operations Numbers Strings List Tuple Dictionary Other Core Types

 Statements and Syntax in Python Assignments, Expressions and prints If tests and Syntax Rules While and For Loops Iterations and Comprehensions

File Operations Opening a file Using Files Other File tools Functions in Python Function definition and call Function Scope Arguments Function Objects Anonymous Functions Modules and Packages

Module Creations and Usage   Module Search Path Module Vs. Script Package Creation and Importing Classes in Python Classes and instances Classes method calls Inheritance and Compositions Static and Class Methods

Bound and Unbound Methods Operator Overloading Polymorphism Exception Handling in Python Programming Default Exception Handler Catching Exceptions Raise an exception User defined exception

Books:-

Python Cookbook, Third edition, by David Beazley and Brian K. Jones

[Head First Python: A Brain-Friendly Guide, by Paul Barry](#)

Elective 1 - **Data Warehousing and data mining**

PROGRAM SPECIFIC OUTCOMES:

- ➢ Be familiar with mathematical foundations of data mining tools.
- ➢ Understand and implement classical models and algorithms in data warehouses and data mining.
- ➢ Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- ➢ Master data mining techniques in various applications like social, scientific and environmental context.
- ➢ Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Objectives:

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Syllabus:

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

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet.

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds

of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis – Data Mining Applications.

Books:-
Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2016
Data Warehousing, Data Mining, & Olap Tata McGraw-Hill Education, 2014

Elective 2-Cloud Computing

PROGRAM SPECIFIC OUTCOMES:

- Understand the concepts of Cloud Computing, key technologies, Strengths and limitations of cloud computing.
- Develop the ability to understand and use the architecture to compute and storage cloud, service and models.
- Understand the application in cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Explain the core issues of cloud computing such as resource management and security.

Course Objectives:

- To understand the concept of cloud computing.
- To study the evolution of cloud from the existing technologies.
- To implement the knowledge of computing on the various issues in cloud.
- To assess services provided by lead players in cloud.
- To study the emergence of cloud as the next generation computing paradigm.

Syllabus:

Introduction: Historical development ,Vision of Cloud Computing, Characteristics of cloud computing as per NIST , Cloud computing reference model ,Cloud computing environments, Cloud services requirements, Cloud and dynamic infrastructure, Cloud Adoption and rudiments .Overview of cloud applications: ECG Analysis in the cloud, Protein structure prediction, Gene Expression Data Analysis ,Satellite Image Processing ,CRM and ERP ,Social networking .

Cloud Computing Architecture: Cloud Reference Model, Types of Clouds, Cloud Interoperability & Standards, Scalability and Fault Tolerance; Cloud Solutions: Cloud Ecosystem, Cloud Business Process Management, Cloud Service Management. Cloud Offerings: Cloud Analytics, Testing Under Control, Virtual Desktop Infrastructure.

Cloud Security: Cloud Information security fundamentals, Cloud security services, Design principles, Secure Cloud Software Requirements, Policy Implementation, Cloud Computing Security Challenges, Virtualization security Management, Cloud Computing Security Architecture .

Market Based Management of Clouds , Federated Clouds/Inter Cloud: Characterization & Definition ,Cloud Federation Stack , Third Party Cloud Services .

Case study : Google App Engine, Microsoft Azure , Hadoop , Amazon , Aneka

Books:-
 1. Buyya, Selvi ,” Mastering Cloud Computing “,TMH Pub
2. Kumar Saurabh, “Cloud Computing” , Wiley Pub
3. Krutz , Vines, “Cloud Security “ , Wiley Pub

Elective 3-Multimedia Communication

PROGRAM SPECIFIC OUTCOMES:

- Communicate clearly and concisely, visually, verbally and in writing, using techniques appropriate for the intended audience.
- Demonstrate knowledge of discipline-specific skills and vocabulary.
- Interpret the ethical, legal, and social impacts of various modes of media delivery and consumption in a wider societal and global context.
- Participate as a team member to make collaborative decisions toward shared objectives with civility and interpersonal skills.
- Construct a body of work that demonstrates visual intelligence, conceptual understanding, collaboration and technical facility at a professional entry level in media design and production.

Course Objectives:

This course will thoroughly examine theories related to communication in the workplace. In addition, strong focus will be given to improving practical, professional communication skills. The course will incorporate current events related to the professional communications field and examine the influence of new technologies on the work place. Practical exercises to build effective communication including e-portfolios and online groups will also be explored.

Syllabus:

Introduction to Multimedia:Multimedia Presentation & Product,Characteristics of Multimedia Presentation,Hardware & Software Requirement,Uses of Multimedia, Steps of Multimedia Presentation:

Text:Types of Text,Insertion of Text,File Format.
Image:Types of Image,Steps for Image Processing,Scanners & Digital Camera
Specification of Digital Images.
Audio & Multimedia:Types of Audio,Voice Recognition & Response,Audio Processing
 Software.
Animation, Introduction, Uses & types of Animation.
Network Essential:Network Types,Network Components,TCP/IP Model,OSI Model.

Multimedia & Internet.
Multimedia application at home and office.
Five classes for Seminars, Internal examination, Project report.

Books:-

1.Multimedia Systems" by Ralf Steinmetz and Klara Nahrstedt

2.Multimedia Communications: Directions and Innovations by J D Gibson

Elective – 4 - **Artificial Intelligence**

PROGRAM SPECIFIC OUTCOMES:

- ➢ Define the meaning of intelligence and study various intelligent agents.
- ➢ Understand, analyze and apply AI searching algorithms in different problem domains.
- ➢ Study and analyze various models for knowledge representation.
- ➢ Understand the basic concepts of machine learning to analyze and implement widely used learning methods and algorithms.
- ➢ Understand the concept of pattern.
- ➢ Classification and clustering techniques**.**

Course Objectives:

- ➢ Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems.
- ➢ Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. Demonstrate proficiency in applying scientific method to models of machine learning.
- ➢ Discuss the awareness of ANN and different optimizations techniques
- ➢ Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- ➢ Demonstrate proficiency in applying scientific method to models of machine learning.
- ➢ Discuss the basics of ANN and different optimizations techniques.

Syllabus:

Overview of AI; Problem solving; various search strategies; Game playing;

Minmax, Alpha- Beta pruning; Logic programming; Inference mechanisms; Knowledge representation: logic, rules, semantics, frames;

Conceptual dependency; Uncertain knowledge and reasoning; Expert Systems;
NLP; Learning; Process planning and robotics; Intelligent agents.

References:
1. Rich and Knight, Artificial Intelligence, Tata McGraw-Hill.
2. Russell and Norvig, Artificial Intelligence: A Modern Approach (3rd Edition), Prentice Hall.
3. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers, Inc.

Elective 5-Distributed Database Management

PROGRAM SPECIFIC OUTCOMES:

- Fragment a database both horizontally and vertically for optimal performance.
- Allocate replicas of fragments for best performance.
- Optimize queries for optimal performance across a distributed database.
- Add distributed transaction management control including concurrency control and replica control to a distributed database.
- Demonstrate expertise in reading peer-reviewed papers in distributed databases and explain them in writing.
- Discuss how current database products implement database distribution including query optimization.

Course Objectives:

1. Understand distributed database systems architecture and design
2. Be able to apply methods and techniques for distributed query processing and optimisation
3. Understand the broad concepts of distributed transaction process
4. Understand the basic concepts of Data warehousing and OLAP technology
5. Be able to apply methods and techniques for association analysis, data classification and clustering.

Syllabus:

Overview; Principles; Dimensions: Distribution, Heterogeneity, Autonomy, Distributed Database Architecture:
Client-Server, Peer-to-Peer, Federated, Multidatabase; Distributed Database
Design and Implementation: Data Fragmentation,
Data Replication and Data Allocation Techniques;
Distributed Query Processing and Optimization; Distributed Transaction Management, Concurrency Control and Reliability, Distributed Database Interoperability.

Books:
1. Ceri, S., Pellagati, G., Distributed Database Principles and Systems, McGraw-Hill International.
2. Ozsu, M.T., Valduriez, P., Principles of Distributed Database Systems, Second Edition, Pearson Education.

Elective 6-Cryptography and Network Security

PROGRAM SPECIFIC OUTCOMES:

To make the student learn different encryption techniques along with hash functions, MAC, digital signatures and their use in various protocols for network security and system security.

Course Objectives:

Analyze and design classical encryption techniques and block ciphers.

✤ Understand and analyze data encryption standard.

✤ Understand and analyze public-key cryptography, RSA and other public-key cryptosystems

✤ such as Diffie-Hellman Key Exchange, El Gamal Cryptosystem etc.

✤ Understand key management and distribution schemes and design User Authentication

✤ Protocols.

✤ Analyze and design hash and MAC algorithms, and digital signatures.

✤ Design network application security schemes, such as PGP, S/ MIME, IPSec, SSL, TLS,

✤ HTTPS, SSH, etc.

✤ Know about Intruders and Intruder Detection mechanisms, Types of Malicious software,

✤ Firewall Characteristics, Types of Firewalls, Firewall Location and Configurations.

Syllabus:

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, TripleDES.

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption

and decryption Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security ofRSA

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA). Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Books:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", PearsonEducation.
2. Behrouz A. Frouzan: Cryptography and Network Security,TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley &Sons
4. BernardMenezes,"NetworkSecurityandCryptography",CengageLearning.
5. AtulKahate, "Cryptography and Network Security",TMH