DEPARTMENT OF COMPUTER SCIENCE ALIGARH MUSLIM UNIVERSITY ALIGARH, U.P. - 202002

SYLLABUS <u>(Ist-SEMESTER)</u>

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1101: PROBLEM SOLVING USING C++

<u>OBJECTIVES OF THE COURSE</u>:
- To understand the need and significance of OOP
- To develop, debug and document programs using OOP paradigms.
- To apply concepts and techniques for implementation using C++

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I
Problem Solving Methods, Different Programming Paradigms, Need of Object Oriented Programming, Procedural Languages, Object Oriented Approach, Characteristics of Object Oriented languages, difference between C and C++, C++ Programming Basics: Basic Program Construction, Directives, Console I/O, Data Types, Operators and expressions, Control Statements, Manipulators, Type Conversions, Arrays and Strings, Structures, Functions: Call by Value, Call by reference, Formal parameters and Actual parameters, Inline function, Recursive Function., Storage Class Specifiers.

UNIT-II
Concept of Object & Classes: Defining classes and objects, Defining member functions, C++ Objects as physical objects, C++ Objects as Data Types, Arrays of Objects, Constructors, Destructors, Copy Constructors, Multiple Constructors, Parameterized Constructors, , Static Class Data, Static Function. Constructor Overloading, Method Overloading.

UNIT-III
Operator Overloading: Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Data Conversions, Manipulation of Strings using operators, Rules for Overloading Operators. Inheritance: Derived Class and Base Class, Derived Class Constructors, Overriding Member Functions, Public and Private Inheritance, Levels of inheritance, Multiple Inheritance, Ambiguity in Multiple Inheritance..

UNIT-IV

Pointers: Address and Pointers, Pointer variable, Accessing the variable pointed to, Pointers and Arrays, Pointers and Functions, Memory management: new and delete, Pointers to Objects, *this* Pointer, Pointers to Pointers; Virtual Functions: Friend Classes and Functions, File Handling in C++, File Pointers, Error Handling in File I/O, Command Line Arguments, Exceptions Handlings.

LABORATORY:

PROGRAMMING EXERCISES in C++: A graded Sheet of assignments/problems will be given to the students to develop Algorithms/Flowcharts & Programs in C++ related to Data Structure and real life problems.

BOOKS:

1. Robert Lafore, *"Object Oriented Programming in C++"*, Pearson
2. Herbert Schildt, *"C++ - A Complete Reference"*, 4th Edition, McGraw Hill Education.
3. E Balagurusamy, *"Object Oriented Programming with C++"*, 6th Edition, McGraw Hill Education.
4. Bergin Joseph, *"Data Abstraction: The Object oriented Approach using C++"*, McGraw Hill Education.

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SYLLABUS (Ist-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1102: Data Structures and Its Applications

OBJECTIVES OF THE COURSE

- To develop the understanding of data structures.
- To learn the applications of various data structures.
- To be familiar with utilization of data structure techniques in problem solving
- To implement them using some programming language.

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I

Introduction, Data Types, Time and Space complexities, Arrays and Strings: Introduction, Data Types-Primitive, Abstract and Polymorphic, Notion of complexity, Derivation of time and space complexities. Array- Linear and Multidimensional Array, Representations and operations, Matrices- Sparse Matrix, String-Representation and operations, Applications-Binary Search, Bubble, Selection and Insertion Sorts

UNIT-II

Linked Lists, Stacks and Queues: Linked List, Linear Linked List, Doubly Linked Lists, Circular and Header Linked List, Representations, Operations and Applications-Polynomial manipulation. Stacks, Different representations and Operations, Multiple Stacks, Applications-Parenthesis Checker, Mathematical Notation Translation (Prefix, Infix, Postfix), Quick Sort, Queue, Different representations and Operations, Linear and Circular Queues, Deques, Applications-Priority Queue.

UNIT-III

Tree and Graphs: Basics of Trees, Representations, Operations and Applications of Binary Tree, Binary Search Tree, AVL Tree, M-Way Search Tree, B Trees, B+ Trees, Threaded Binary Trees, Heap.
Graph Terminology, Different Representations, Operations and Applications, Breadth First Search (BFS), Depth First Search (DFS), Spanning Trees, Minimum Spanning Trees, Single Source and All Pair Shortest Path Algorithms.

UNIT-IV
Searching, Sorting, Merging and Hashing:
Linear and Binary Search Methods, Merging, Sorting-Bubble, Selection, Insertion, Radix, Merge, Quick, Heap Sorts,
Hashing- Introduction, Hash Table, Hash Functions, Collisions and Resolution.

BOOKS :

1. R.S. Salaria, *"Data Structures and Applications using C",* 5th Edition, 2012, Khanna Book Publishing.

2. Cormen, Rivest and Leiserson, *"Introduction to Algorithms",* 3rd Edition, PHI, 2009.

3. Tremblay & Sorenson, *"An Introduction to Data Structures with Applications",* 2nd Edition, 2001, Mcgraw Hill.

4. Lipschutz, *"Data Structures",* 1st Edition, 2005, Tata Mcgraw Hill.

5. J. P. Tremblay and R.B. Bunt, *"An Introduction of Computer Science –An Algorithmic Approach",* 1989, Tata Mcgraw Hill.

6. Robert L. Kruse & A. J. Ryba, *"Data Structures and Program Design in C++",* 2000, Prentice Hall.

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SYLLABUS (Ist-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1103: Systems Analysis and Design

OBJECTIVES OF THE COURSE
- To learn basic concepts of Systems,
- To learn various tools and techniques related to System Analysis, Design and Implementation
- To apply the concepts in analyzing and designing real life systems

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I
Concepts of Data, Information, Types of information: formal Vs informal information, information attributes, Data Operations, The System Concept: Elements of a system, Types of systems. Organization perceived as a System, Management functions, planning, controlling, decision-making, programmed decision making, non-programmed decision making.

UNIT-II
Overview of Systems Analysis and Design: System Development Life Cycle (SDLC), Description of the phases and major deliverables and broad activities associated with each phase. Role and Task of a System Analyst, Attributes of a System Analyst and tools used in System Analysis. Information Sources and Gathering Methods, Interviewing, Questionnaires.

UNIT-III
Feasibility Study and Cost Estimation: Cost-Benefit Analysis Methods, Tangible/Intangible benefits and costs, Feasibility Study Report.

Tools for Systems Analyst: Introduction to Data Flow Diagrams (DFD), Leveling of DFDs, Leveling rules, drawing logical and physical DFDs – software tools to create DFDs. Introduction to Structured English, Decision Table and Decision Tree.

Conceptual Data Modeling; Introduction to Data Dictionary and ER Diagram- usage and example.

UNIT-IV

Designing INPUT and OUTPUT, FORMS and REPORTS, USER INTERFACES, good and bad examples, Guidelines for good design, Making the System Operational: System Implementation; Testing and Quality Assurance, Testing Tools, Conversion And Support; System Conversion, User Training, Post Implementation review.

Laboratory :

1. Designing complete Information System Using SSAD Techniques- Case Studies of I.S.

2. Using CASE Tools for Analysis, Design & Implementation of Information Systems (e.g., Introduction to Visual Case Tools/Rational Rose).

BOOKS :

1. Birch JG And FR Strater, *"Information System Theory And Practice",* Santa Barbara: Hamilton
2. Gaines C & R Sarson, *"Structure System Analysis Tools And Techniques",* Prentice Hall
3. Lundeberg, Mats, Gonan Gold et al, *"Information System Development: A Systematic Approach"*
4. Cougher J. D, MA Cotler and RW Knapp, *"Advanced System Development and Feasibility Techniques",* Wiley, New York
5. V. Rajaraman, *"Analysis and Design of Information System",* PHI
6. Haryszkiewycz, I. T. *"Introduction to System, Analysis & Design"*
7. Whiten, J.K., Bentley, L. D., Beslow, V. M., *"System Analysis & Design Methods"*

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SYLLABUS (Ist-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1104: Digital Logic and Computer Organization

OBJECTIVES OF THE COURSE
- To introduce basics of digital logic circuits design and Computer Organization.
- To identify various number systems and work with Boolean Algebra
- To understand various logic gate
- To simplify the Boolean expression using K-Map and Tabulation techniques
- To analyze various types of flip flops used for designing registers and counters
- To understand the basic structure and operation of digital computer
- To study the hierarchical memory system including cache memories and virtual memory
- To study the different ways of communicating with I/O devices and standard I/O interfaces

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I
Introduction to Digital Computer, Data Representation, Integer Representation, Boolean Algebra, Simplification of Boolean Expressions, Logic Gates, TTL circuits, Combinational Circuit, Design Procedures, Some commonly used combinational circuits, Binary Adder, Binary Subtractor 2's complement Adder Subtractor, designing with Multiplexers.

UNIT-II
Sequential Circuits, Flip-Flop, RS-FF, JK FF, Master Slave JK FF, D-FF, T-FF, Buffer Register, Shift Register, Ripple counter, Synchronous counter, Controlled Counter, Ring counter.

UNIT-III
Memory Device Characteristics, 2D & 3D Memories, Memory Hierarchy, Semiconductor Memories: RAM, ROM, DRAM, Flash Memory; High Speed Memories: Cache Memory, Associative Memory, Memory Interleaving.

UNIT-IV
Input/Output Interface, I/O Bus and Interface modules, Data transfer modes (Programmed mode, Interrupt initiated I/O, DMA), Interrupt structure, Input-Output Processor (IOP), CPU-IOP Communication, Introduction to advanced computer Architectures, RISC vs CISC Architectures, Types of Parallel processors,

Flynn's classification of computer systems, Pipeling, Arithmetic and instruction pipelining, Multiprocessor organizations (Loosely coupled vs Tightly coupled).

Laboratory : Writing Simple Programs for Logic Circuits.

BOOKS :

1. MANO, M., *"Digital Logic and Computer Design"*
2. Malvino A.P., *"Digital Computer Electronics"*
3. Bhujade M.R., *"Digital Computer Design Principles"*
4. Raja Raman V. and Radha Krishnan T., *"An introduction to digital computer design"*
5. MANO, M., *"Computer System Architecture"*
6. Stallings, W., *"Computer Organization & Architecture"*
7. B. Ram, *"Computer System Organization & Architecture"*

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SYLLABUS (Ist-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1105: Fundamentals of IS and IT

OBJECTIVES OF THE COURSE

• To help learners in developing broad understanding of information systems, seen within organizational and societal contexts.

• To provide students with an appropriate balance of technical and organizational perspectives to serve as the basis for further study in the field of IS and IT.

Credit : 02
Sessional Marks : 30
Final Marks : 70

UNIT-I

Foundations of Information Systems in Business: Foundation Concepts in Information Systems and Technologies, Business Applications, Development, and Management, Competing with Information Technology: Fundamentals of Strategic Advantage, Using Information Technology for Strategic Advantage

UNIT-II

Data Resource Management: Managing Data Resources, Technical Foundations of Database Management, Telecommunications and Networks: The Networked Enterprise, Telecommunications Network Alternatives, Computer Hardware: Computer Systems; End-User and Enterprise Computing, Computer Peripherals: Input, Output, and Storage Technologies, Computer Software: Application Software: End-User Applications, System Software: Computer System Management

UNIT-III

Introduction to e-Business Systems: Functional Business, Cross Functional Enterprise Systems, Applications in Business and Management: a) Enterprise e-Business Systems - Customer Relationship Management; the Business Focus, Enterprise Resource Planning; The Business Backbone, Supply Chain Management; the Business Network, b) Electronic Commerce Systems: Electronic Commerce Fundamentals, its Applications and Issues, c) Decision Support Systems: Decision Support in Business, Artificial Intelligence Technologies in Business

UNIT-IV

Developing Business: IT Strategies & IT Solutions; Planning Fundamentals, Implementation Challenges, Developing e-Business Systems, Implementing e-Business Systems. Management Challenges: Security, Ethical, and Societal Challenges, Security Management, Managing Information Technology, Managing Global IT

BOOKS:

1. James A. O'Brien, George M. Marakas, *"Introduction to Information Systems",* McGraw-Hill, 2013.
2. Ralph Stair George Reynolds, *"Information System Essentials",* Seventh Edition, Course Technology, Cengage Learning.
3. Efraim Turban, R. Kelly Rainer, Richard E. Potter, *"Introduction to Information Technology",* Wiley.
4. R. Kelly Rainer, Brad Prince, Casey G. Cegielski, *"Introduction to Information Systems: Supporting and Transforming Business",* Wiley .
5. T. Cornford, M. Shaikh, *"Introduction to Information Systems",* University of London Press, 2013.

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SYLLABUS (Ist-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1106: Soft Skills Development

OBJECTIVES OF THE COURSE:

- To help learners develop their soft skills and develop their personality together with their technical skills.
- To developing professional, and Interpersonal skills to harness hidden strengths, capabilities and knowledge equip them to excel in real work environment and corporate life.
- To help learner in managing stress and handling computing related health hazards

Credit : 02
Sessional Marks : 30
Final Marks : 70

UNIT-I

Introduction to Soft Skills and Hard Skills
Personality Development: Knowing Yourself, Positive Thinking, Communication Skills, Non-Verbal Communication, Physical Fitness
Emotional Intelligence: Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Emotion Scales, Managing Emotions. Skills to Develop Emotional Intelligence.
Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette.

UNIT-II

Professional Skills
Creativity at Workplace: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method
Capacity Building: Learn, Unlearn and Relearn: Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for Capacity Building.
Leadership and Team Building: Leader and Leadership, Nature and Types. Qualities and Functions of good leadership, Skills of a good Leader, Assessment of Leadership skills, Team Building, Types of Teams, Necessity of Team Work Personally, Socially and Educationally.
Time Management: Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work.
Values and Ethics: An Introduction, Goals and Mission of Life, Vision of Life. Ethics and Society, Theories of Ethics, Correlation between Values and Behaviour, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics, Ethical and Unethical practices in computing

UNIT-III
Computing Health and Safety:
Understanding Health Issues: Eye strain and computer vision syndrome, Cervical spondylitis, Repetitive Strain Injury (RSI), Carpal tunnel syndrome (CTS), Lower back pain, Mental stress and depression, fatigue, Digestive problem, Skin problem and allergies, Internet addiction & Radiation: symptoms, risk factors and precautions, Health related ergonomic concerns and solutions: Posture, furniture and equipments, Do's and Don'ts, Best practices, Musculoskeletal disorders (MSDs) and Medical Management, Environmental Issues: Space, Noise, humidity, thermal condition, lighting, air quality etc.,

UNIT-IV

Stress Management: Stress and distress, Causes of Stress and its impact, Ways to Cope with Stress, Importance of Physical and Emotional fitness.

Yoga and exercise for IT Professionals: Padahastasana, Shashankasana, Setubandhasana, Shalabhasana, Bhujangasana, Suryanamaskar, Kapalbhati, Nadishoddi ,Pranayama, *Taratak:* up and down, side (right and left), diagonal(right and left), rotation (clockwise and anti -clockwise), *Relaxation:* Balasana, Makrasana and Shavasana, Loosening Exercise, *Hand Movements:* clockwise and anticlockwise,
Elbow Movement: in and out, *Wrist Rotation:* clockwise and anti-clockwise, in and out, *Hip rotation:* clockwise and anti-clockwise, *Neck Movements:* Up and down, right and left, rotation-clockwise and anti-clockwise

<u>BOOKS</u> :

1. Gajendra S. Chauhan, Sangeeta Sharma, *"Soft Skills: an Integrated Approach to Maximise Personality",* Wiley India
2. Barun K. Mitra, *"Personality Development and Soft Skills",* Oxford Press
3. M. S. Rao, *"Soft Skills - Enhancing Employability",* I. K. International
4. Sherfield, *"Cornerstone: Developing Soft Skills",* Pearson India
5. Daniel Coleman, *"Emotional Intelligence",* Bantam Book, 2006.
6. Carnegie Dale, *"How to win Friends and Influence People",* New York: Simon & Schuster, 1998.
7. Sandy Blaine, *"Yoga for Computer Users: Healthy Necks, Shoulders, Wrists, and Hands in the Postmodern Age",* Rodmell Press, 2008

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SYLLABUS (Ist-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-1171: Laboratory Course-I

OBJECTIVES OF THE COURSE

- To acquire skills of using Operating Systems (like,Windows/Linux)
- To learn using PC-Packages
- To learn C++ programming language
- To learn implementation of various Data Structures
- To learn using various tools used for System Analysis and Design

Credit : 04
Sessional Marks : 40
Final Marks : 60

LAB:

Introduction to MS-DOS, UNIX/Linux and Windows Operating System

Using MS-Office (Word, Excel, Power Point & MS-Access)

Developing Web Applications using HTML/FrontPage/CSS or Similar Tools.

Developing simple Application Packages using MySQL and HTML

Programming exercise in C++ (graded sheets of problems)

Applying data structures in solving real life problems

NOTE:

For detail Problems/Assignments related to LAB, students are advised to consult the *LAB MANUAL* for CSM-11P1.

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SYLLABUS (IInd-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)

COURSE CSM-2201: Object Oriented Programming using Java

OBJECTIVES OF THE COURSE

- To understand Object Oriented Concepts using Java Language.
- To develop, debug and document programs in Java using OOP paradigms.

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I   To learn about history of Java, To learn, where is Java being used, To learn, what is the Java Virtual Machine? What is its role?, To learn about various standard packages available in java and their uses. Java naming conventions.

Introduction to java, comparison between C, C++ and Java, Why java is so important, Compiling and running java program. Basic structure of java program, Java programming: data types, variable, constants, operators, control statements (if, switch, loops),break, continue statements, ternary operator, bit wise operators, user defined data types in Java. Order of evaluation of different operators in java. How to read input from keyboard?

UNIT-II   Objects, classes and methods, Constructing objects, Accessor and mutator methods, object references, Java classes: Abstract classes, static classes, Inner classes, Wrapper classes; Designing classes: Choosing classes, accessors, mutators and immutable classes, side effects, static methods, static field, scope, introduction to strings, string tokenization, methods, method overloading, constructor overloading, use of *this* keyword, use of toString ( ) method, arrays. Arrays of objects, recursive method.

UNIT-III   Defining an interface, implementing interfaces, using interfaces for code reusing, converting between class and interface types, using interfaces for callbacks; Polymorphism, Inheritance: Inheritance hierarchies, Inheriting instance fields and methods, Sub class construction, converting between sub class and super class types, cosmic super class, Access control: private access, public access, protected access and package access.

UNIT- IV Exception handling**:** Importance of exceptions, throwing exceptions, checked and unchecked exceptions, catching exceptions, finally clause. Files and Streams: streams, readers, and writes, reading and writing text files. Applets and Graphics: Why applets, Introduction to HTML, A simple applet, graphical shapes, colors, fonts, drawing complex shapes, reading text input inside applet. AWT: introduction, labels, buttons, check boxes, events etc; Layout manager**:** flow layout, border layout, grid layout, card layout; Menus: Dialog boxes, File dialog; Applet classes, Applet life cycle. Introduction of Java Swing.

BOOKS:

1. Java Concepts, 5th Edition (John Wiley & Sons, Inc.) by Cay Horstmann.
2. Big Java (John Wiley & Sons, Inc.) by Cay Horstmann.
3. Java, How to Program, 6th Edition (Prentice-Hall) by Deitel and Deitel
4. Java in a Nutshell, 5th Edition (O'Reilly) by David Flanagan

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SYLLABUS (IInd-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)

COURSE CSM-2202: Database Management System

OBJECTIVES OF THE COURSE:

- To introduce the concept of DBMS and providing a general introduction to relational, object and object-relational model.
- To help students learn SQL using ORACLE

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I
Basic concepts, Database & Database Users, Characteristics of the Database, Database Systems Concepts & Architecture, Data Models, Schemas & Instances, Sub-schemas, Data Dictionaries, DBMS Architecture & Data Independence, Type of Database Languages, Interfaces, Query Languages, Data modeling using the Entity-Relationship model, UML, Enhanced Entity-Relationship and Object Modeling, Relational Model, Languages & Systems, Relational Data Model & Relational Algebra: Relational Model Concepts, Relational Model Constraints, integrity constraints, Relational Algebra: relational domain & tuple calculus

UNIT-II
SQL - A Relational Database language (DDL, DML, Views, Embedded SQL) , Data Definition in SQL, View & Queries in SQL, Specifying Constraints & Indexes in SQL, Specifying Constraints & Indexes in SQL, Cursor, Triggers, procedure and function in database, Relational Database Management Systems, Introduction to Conventional Data Model & Systems: Network Data Model & IDMS Systems, Hierarchical Data Model & IMS System. Object and Object -Relational Databases: Overview of Object Database Concepts, Object-Relational Features: Object Database Extensions to SQL. The ODMG Object Model and the Object Definition Language ODL, Object Database Conceptual Design, The Object Query Language (OQL).

UNIT-III
Relational Data Base Design, Function Dependencies & Normalization for Relational Databases, Functional Dependencies, Multi varied & join dependencies, Normal forms based on primary keys (INF, 2NF, 3NF & BCNF), Loss less join & Dependency preserving decomposition, Transaction Processing Concepts and Theory, Concurrency Control & Recovery Techniques, Locking Techniques, Time stamp ordering Granularity of Data items, Database backup and recovery from catastrophic failures.

UNIT-IV

Database Security & Authorization: Introduction to database security issues, Discretionary Access control based on granting & revoking privileges, Mandatory Access control & role based Access Control for multilevel security. Introduction to statistical database security. Introduction to flow control, Encryption & Public key infrastructure, A case study of Oracle DBMS and Information system development using Oracle.

BOOKS:

1. Date, C.J.,"An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Elmsari and Navathe,"Fundamentals of Database Systems", 7th Edition, Pearson.
3. Desai, B., "An Introduction to Database Concepts", Galgotia Publications, New Delhi.
4. Ullman, J.D.,"Principles of Database Systems", Galgotia Publications, New Delhi.
5. James Mortin- Principles of Database Management Object Oriented Modeling & Design.
6. A. Silberschatz, H. Korth and S. Sudarshan, Database System Concepts (5th ed.), McGraw Hill, 2006.
7. Philip Lewis, Arthur Berstein and Michael Kifer, Databases and Transaction Processing and application oriented approach, Addison Wesley, 2002.

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<u>SYLLABUS (IInd-SEMESTER)</u>

<u>MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)</u>

COURSE CSM-2203: Object Oriented Analysis and Design of Information Systems

<u>OBJECTIVES OF THE COURSE</u>

- To develop understanding about the concepts of Analysis & Design of Information Systems using Object Oriented approach and introducing object modeling tools & techniques.
- To expose students to real-life situations related to Information System modeling using case studies

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I   Introduction : System development life cycle & variations, Approaches to system development, SSAD Vs OOAD, Overview of OOAD methodologies, The Unified Process and its characteristics, Unified Process life cycle, Fundamental concepts of object orientation: object, class, abstraction, encapsulation, inheritance, polymorphism, delegation etc., Model and its purpose, principles of modeling, Object Oriented modeling: Introduction to UML, UML Building Blocks.

UNIT-II   System Analysis (OOA): Capturing, modeling and documenting system requirements, Identifying classes, attributes and operations, Classes and object relationships: Generalization & specialization, Links and associations, aggregation, multiplicity etc, Creating class diagram, Dynamic modeling: Events, States, State transition & scenarios, Modeling dynamic behavior using sequence diagram, collaboration diagram and state chart diagram, Introduction to Activity diagram: Branches, forks, joins, swimlanes etc., Introduction to Use-case modeling: Identifying use-cases, actors, include and extend relationships etc., use-case diagram.

UNIT-III   System Design (OOD): Elements of design, Designing application architecture, Design models: Package diagram, Component and Deployment diagram, Design class diagram, Designing Inputs outputs and controls, An overview of Design Patterns: Creational, Structural and Behavioral design patterns.

UNIT-IV   Case study: Library information system, Electricity billing system, Hostel information system, Hospital management system, customer support system etc.

Laboratory :
1. Designing complete Information System Using OOAD Techniques- Case Studies of I.S.
2. Using CASE Tools for Analysis, Design & Implementation of Information Systems (e.g., BOUML/Rational Rose/Visual Case Tools).

BOOKS :

1. Booch, G. ―*Object Oriented Analysis & Desing*‖, Addison-Wesley.
2. Rumbaugh, J. et. al. ―*Object Oriented Modelling and Design*‖, PHI.
3. Jacobson, I. et. al. ―*Object Oriented Software Engineering*‖, Addison-Wesley.
4. Kahate, Atul. ―*Object Oriented Analysis & Desing*‖, TMH.
5. Bahrami, Ali. ―*Object Oriented System Development*‖, McGraw Hill.
6. Booch, G., Rumbaugh, J., Jacobson, I. ―*The Unified Software Development Process*‖, Addison-Wesley.
7. Booch, G., Rumbaugh, J., Jacobson, I. ―*The Unified Modeling Language User Guide*‖, Addison-Wesley.
8. Booch, G., Rumbaugh, J., Jacobson, I. ―*The Unified Modeling Language Reference Manual*‖, Addison-Wesley.
9. Martin Fowler, ―*UML Distilled*‖, Addison-Wesley.
10. Larman Craig ―*An Introduction to Object Oriented Analysis & Desing*‖ Prentice Hall.
11. Gamma, E., Helm, R., Johnson, R., Vlissiles, J. ―*Design Patterns: Elements of Reusable Object Oriented Software*‖, Addison-Wesley.
12. Jim Arlow, Ila Neustadt ―UML & the Unified Process: Practical Object Oriented Analysis and Design‖ Addison Wesley.
13. Tom Pender ―UML Bible‖ wiley
14. David A. Taylor ―Object Technology : A Manager's Guide
15. Paul Kimmel ―UML Demostified‖ Mc Graw Hill Osborne Media
16. Alan Dennis, Barbara H. Wixom & David Tegarden ―System Analysis & Design with UML‖, Wiley
17. Simon Bennett, Tolin Skelfon, KenUnn ―Schaum's Outline of UML‖ McGraw Hill

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<u>SYLLABUS (IInd-SEMESTER)</u>

<u>MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)</u>

COURSE CSM-2204: Numerical and Statistical Computing

<u>OBJECTIVES OF THE COURSE</u>

- To develop a thorough understanding of the methods of numerical differentiation and integration
- To gain knowledge in measures of central tendency and dispersion
- To learn how to formulate and test the hypotheses about means, proportions and standard deviation to draw conclusions based on the results of statistical tests in large sample.
- To get exposed to finite differences and interpolation
- To develop, debug and document programs for solving numerical and statistical problems.

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I   **Floating Point Arithmetic:** Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation. Computer Arithmetic: Significant Figures, Rounding off, Truncation, Absolute, Relative and Percentage Errors, Function of Single and Several Variables, Propagation of Errors in Arithmetic Operations.

Numerical Differentiation and Integration: Introduction   to Numerical Differentiation, Numerical Integration: Trapezoidal rule, Simpson's rules, Numerical Solution of Ordinary Differential Equations: Taylor's Series and Euler's Methods, Modified Euler's Method, Runge-Kutta and Predictor-Corrector Methods, Automatic error monitoring, Stability of solution.

UNIT-II   **Solutions of Transcendental and Simultaneous Linear Equations:**
Solution of Non-linear Equations: Newton Raphson Method, Bisection Method, Regula-Falsi Method, Discussion on Convergence of Solution.
Solution of Simultaneous Linear Equations: Iterative Methods, Gauss Jacobi Iterative Method, Gauss-Seidel Iteration Method, Comparison of Direct and Iterative Methods.

UNIT-III   **Interpolation and Approximation:**

Interpolation with Unequal Intervals: Lagrange's Method, Divided Difference Method, Divided Difference Table, Newton's Divided Difference Method, Inverse Interpolation, Polynomial and Curve Fittings, Correlation: Partial and multiple Correlation (for three variables only), Method of least squares, fitting of straight lines, polynomials, exponential curves.

UNIT-IV   **Statistical Computation:**

Statistical tools and techniques: Measure of central tendencies: Mean, Mode, Median, Measure of dispersion: Range, Variance and Standard Deviation, Frequency Distribution and Cumulative Frequency Distributions, Regression Analysis: Linear and Non linear regression, Multiple regression, Testing of Hypothesis: Test of Significance, Chi-square test, t-test, ANOVA, F-test.

Laboratory: Using **MATLAB** in solving problems specified in lab manual.

BOOKS:

1. Keter And Prawel - Numerical Methods For Engineering Students.
2. Rajaraman - Computer Oriented Numerical Methods.
3. Shan S. Kuo - Computer Applications of Numerical Methods.
4. Dodes A. - Numerical Analysis For Computer Science.
5. S. Sastry - Introductory Methods of N.A.
6. M. K. Jain and Lyenger - Numerical Methods For Scientific And Engineering Computation.
7. Dr. M. Shanta Kumar - Computer Based Numerical Analysis.
8. S. P. Gupta- Fundamental of Statistics
10. A.M. Goon, M.K. Gupta and T.S. Dasgupta, Fundamentals of Statistics (7th ed.), Vol. I, The World Press Pvt. Ltd., 2000
11. A.M. Goon, M.K. Gupta and T.S. Dasgupta, An Outline of Statistical Theory (2nded.), Vol. II, The World Press Pvt. Ltd., 2000
12. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, 2007
13. S.R. Otto Denier, An Introduction to Programming and Numerical Methods in MATLAB, and J.P. Springer, 2005
14. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation (7th ed.), New Age International Publishers, 2007

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<u>SYLLABUS (IInd-SEMESTER)</u>

<u>MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)</u>

COURSE CSM-2205: Design and Analysis of Algorithms

<u>OBJECTIVES OF THE COURSE</u>

- To introduce the basic concepts of Algorithm design.
- To analyze the complexity of an Algorithm.
- To develop an understanding of various Algorithm paradigms.

Credit : 02
Sessional Marks : 30
Final Marks : 70

<u>UNIT- I</u>
Introduction, Growth Functions and Recurrences: Role of Algorithms in Computing, Analysing and designing of algorithms, Mathematical Foundations, Methods of Proof-Induction, Contradiction, Growth Functions-Different Asymptotic Notations, Worst, Average and Best case Analysis, Recurrences- Substitution, Recursion Tree and Master Methods.

<u>UNIT- II</u>
Brute Force and Divide and Conquer Methods: Brute Force, Exhaustive Search-Travelling Salesman Problem, Knapsack Problem and Assignment problem. Divide and conquer method– Merge sort, Quick sort, Binary search, Strassen's Matrix Multiplication.

<u>UNIT- III</u>
Dynamic Programming, Greedy Techniques and Randomized algorithms: Elements of Dynamic Programming, Assembly Line Scheduling, Matrix Chain Multiplication, Elements of Greedy Algorithms, Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees. Randomized Algorithms

<u>UNIT- IV</u>
Complexity Theory and Approximation algorithms: Introduction, P, NP, NP-Hard, NP-Complete and Associated Problems, Approximation Algorithm- Vertex Cover and Travelling Salesman-Problem.

BOOKS :

1. Cormen, Rivest and Leiserson, "**Introduction to Algorithms**", 3rd Edition, PHI, 2009.

2. Tremblay & Sorenson, "**An Introduction to Data Structures with Applications**", 2nd Edition, 2001, Mcgraw Hill.

3. J. P. Tremblay and R.B. Bunt, **"An Introduction of Computer Science – An Algorithmic Approach"**, 1989, Tata Mcgraw Hill.

4. Robert L. Kruse & A. J. Ryba, "**Data Structures and Program Design in C++"**, 2000, Prentice Hall.

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SYLLABUS (IInd-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)

COURSE CSM-2206: Technical Communication

OBJECTIVES OF THE COURSE

- To help students achieve proficiency in English and develop their professional communication and report writing skills to meet the demand in the field of global communication.
- To enable students successfully communicate verbally and technically with ease and confidence in any real-life situation

Credit : 02
Sessional Marks : 30
Final Marks : 70

UNIT-I

Fundamentals of Written and Oral Technical Communication: Distinction between General and Technical communication, Importance of technical communication, Barriers to Communication. Constituents of Technical Written Communication.

Words and Phrases, Word formation. Synonyms and Antonyms; Homonyms, Homophones; Eponyms, Phrasal Verbs, Idioms, One-Word Substitutes, Select vocabulary of about 500-1000 New words; Correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

UNIT-II

Communicative Grammar: Introduction, Nouns, Gerunds, Infinitives, Subject-Verb Agreement, Tenses, Active and Passive Voice, Conditional Sentences, Adjectives and Degrees of Comparison, Adverbs, Conjunctions, Prepositions, Articles, Mood, Emotions, Attitude Oral Communication

UNIT-III

Technical Report writing: Techniques for Good Technical Writing, Referencing and Styling, Right Words and Phrases, Sentences, Writing an official / Business letter, Cover Letters, Emails, Preparation of Bio-Data, Note-making/Memos, Writing Summaries of passage,
Fundamentals of Report Writing: Characteristics of a Report, Categories of Reports, Structure of Reports, Writing the Report, Characteristics and Components of a Research Paper, Dissertation, Techniques of writing Technical Proposal, preparing software user manual, preparing project Documentation.

UNIT-IV

Effective Presentation Strategies, Interviews and Group Communication: Controlling Nervousness and Stage Fright, Using Visual Aids in Presentations as a tools to counter weaknesses, Objectives of Interviews, Types of Interviews, Job Interviews, Media Interviews, Press Conferences, Forms of Group Communication, Use of Body Language, Discussions, Group Discussions, Organizational GD, GD as Part of Selection Process, Meetings, Conferences, Symposia and Seminars, Negotiations, Telephonic Conversations and Etiquette, Dialogue Writing

Suggested Assignments for Continuous Evaluation Component:
• Group Discussion Sessions
• Mock Interviews
• Write their own Resume
• Assignment on Report Writing, Letter Writing, Memo Writing and Technical Reports
• Assignment on English Grammar

<u>BOOKS</u>:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication – Principles and Practice", 2nd Edition, Oxford University Press, 2011.
2. Hedwig Lewis, "Body Language", Response Books
3. Ashraf Rizvi, "Effective Technical Communication", TMGH Publication
4. Sharma, "Business Correspondence & Report Writing", TMH
5. Prasad, "Group Discussion & Interview (With Audio Cassette)", TMH
6. Sashi Kumar, "Spoken English (with Cassette)", TMH
7. Raymond Murphy, "English Grammar In Use", Cambridge University Press
8. Martin Hewings, "Advanced Grammar in Use", Cambridge University Press

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COURSE CSM-2271: Laboratory Course-II

<u>OBJECTIVES OF THE COURSE</u>

- To learn and implement OOP concepts using Java programming language
- To help students learn programming in SQL and PL/SQL using ORACLE
- To learn using various tools for OOAD
- To help students learn solving numerical and statistical problems using **MATLAB**
- To learn implementation of various types of algorithms

Credit : 04
Sessional Marks : 40
Final Marks : 60

<u>LAB:</u>

Programming exercise in Java (graded sheets of problems as specified in Lab Manual)

Developing database and writing queries using Oracle

To write, debug and implement programs in PL/SQL using Oracle

Designing complete Information System Using OOAD Techniques- Case Studies of I.S.

Using CASE Tools for Analysis, Design & Implementation of Information Systems (e.g., BOUML/Rational Rose/Visual Case Tools).

Using MATLAB for solving Numerical and Statistical Problems

Implementing various algorithms like Travelling Salesman Problem, Knapsack Problem, Sorting, Kruskals Algorithms, Dijkstra's Algorithms, etc using C/C++

<u>NOTE:</u>

For detail Problems/Assignments related to LAB, students are advised to consult the *LAB MANUAL* for CSM-22P1.

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COURSE CSM-3301: Web Based Programming

OBJECTIVES OF THE COURSE:

- To understand the concept of Web Application Development and its Architecture.
- To understand the Essentials of Web Application Development.
- To understand and practice web page designing techniques.
- To understand the differences between client side & server side technologies to develop Web Application

Credit : 04
Sessional Marks : 30
Final Marks : 70

Unit I
Introduction:

Internet Standards, Introduction to WWW, WWW Architecture, client and server, web server, web application basic pieces, working of a website, Internet Protocols, Overview of HTTP, HTTP request – response, Generations of dynamic web pages, Front end and backend web development, web content management systems: Wordpress, Joomla, web development life cycle, Guidelines for Indian Government websites.

Unit II
Basics of HTML,CSS, JavaScipt:

HTML and HTML5: Introduction, TML Tags, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, HTML Forms. Cascading Style Sheet (CSS): Introduction, Basics of CSS, style types. JavaScript: Introduction, variables, operators, conditionals, looping and validation. Introduction to Jquery, Ajax and XML.

Unit III
Introduction to PHP:

PHP structure: basic syntax, variables, operators, multiline commands. Expression and control flow in PHP, PHP dynamic linking. PHP functions and Objects, PHP arrays, Practical PHP: Date and time functions, file handling, system calls. Accessing and manipulating database using PHP, Error handling in PHP, generating images with PHP. Cookies, sessions and authentication.

Unit IV
Introduction to ASP.NET:

Getting started with ASP.NET, Building an ASP.NET web site, designing web pages, working with ASP.NET server controls, programming ASP.NET web pages, creating consistent looking web sites, navigation: move around web site, navigation controls. User controls, validating user inputs. Security pitfalls and basic solutions (SQL injections, cross site scripting (XSS), cross site request forgery, DoS, DDoS).

TEXT BOOKS:

1. Learning PHP, MySQL & JavaScript with JQUERY, CSS & HTML5: Robin Nixon (O'Reilly)
2. Beginning ASP.NET 4 in C# and VB: Imar Spaanjaars(Wiley-India Edition).
3. Learning Web Design: A Beginner's Guide to (X)HTML, Style Sheets and Web Graphics: Jennifer Niederst Robbins (O'Reilly).

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<u>SYLLABUS (IIIrd-SEMESTER)</u>

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COURSE CSM-3302: Operating System

OBJECTIVES OF THE COURSE
- To develop the understanding of the structure and functioning of Operating System.
- To learn about Processes, Threads and Scheduling algorithms
- To understand the principles of concurrency and Deadlock
- To learn various memory management schemes
- To study I/O management and File systems

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I
INTRODUCTION Evolution of Operating System, Operating System Structure, types of Operating System: Batch Processing, Multiprogramming, Timesharing, Distributed System, Real Time System. Process: Concepts, Process control blocks, concurrency, mutual exclusion, semaphores, Interprocess Communication, Process Synchronization.

UNIT-II
Processor management techniques; Threads, Process Scheduling, Scheduling Criteria types of scheduling, scheduling algorithms, Deadlocks, Deadlocks Prevention, Deadlocks Avoidance, Deadlocks Detection.

UNIT-III
Memory Management: Real storage, Contiguous Vs. Non Contiguous storage allocation, Static and Dynamic Partitioned memory allocation; Virtual memory, management of virtual memory, Paging, Segmentations, Segmentation with Paging.

UNIT-IV
I/O Management: Disk Organization, disk space management, disk scheduling, Files types and operations, File access and security, File storage Management, File Organization, Operating System security, Case Study of UNIX/LINUX OS.

<u>BOOKS</u> :
1. Harvery M. Deitel, *"An Introduction to Operating System"*
2. P.C.P.Bhatt, *"An Introduction to Operating System Concepts and Practice"*
3. D.M.Dhamdhere, *"Operating System"*
4. J. Archer Harris, *"Operating System"*
5. A. S. Tanenbaum, *"Modern Operating Systems"*, PHI
6. William Stallings, *"Operating Systems – internals and design principles"*, PHI
7. Silberschatz, Galvin, Gagne, *"Operating System Concepts",* John Wiley & Sons.

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COURSE CSM-3303: Software Engineering and Quality Assurance

<u>OBJECTIVES OF THE COURSE</u>:

- To understand the methodologies involved in the development and maintenance of software (i.e.) over the entire life cycle.
- To learn about generic models of software development process
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the different design techniques and their implementation.
- To learn various testing and maintenance measures
- To understand Project management and Quality Assurance plan and measures

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I **Introduction to Software Engineering:** The Evolving role of software. Software characteristics and applications**,** Evolution of Software Engineering, Software crisis, Software Engineering problems, Software development life cycle. Software Engineering Paradigms, Software Process, Project and Products.
Planning a Software Project: Cost Estimation (COCOMO and Function Points Model), Project Scheduling, Staffing and Personnel Planning, Software Configuration Management Plan, Quality Assurance Plans, Project Monitoring Plans, Risk Management.

UNIT-II **Software Design:** Design objectives and principles, Design for Reuse & Change, Design Methodology: Structured Design and Object-oriented approach. Module level concepts: Coupling and Cohesion. Design Notation and specification, Metrics, Design validation & verification, Metrics.
Detailed Design: Module specification, Detailed Design, Verification and Metrics (Cyclomatic Complexity, Data Bindings, Cohesion Metric).

UNIT-III **Software Implementation:** Implementation issues, Coding. **Programming Practices:** Structured coding and object oriented coding techniques, Modern programming language features. Verification and Validation techniques (Code reading, Static Analysis, Symbolic Execution, Proving Correctness, Code Inspections or Reviews, Unit Testing). **Coding:** Programming Principles and guidelines, Coding Process **Metrics:** Size Measures, Complexity Metrics, Style Metrics. **Documentation:** Internal and External Documentation.

UNIT-IV　　**Software Testing, Maintenance and Quality Assurance:** Error, Fault and Failure, Test Oracles, Test Case and Test Criteria, Psychology of Testing. Testing Objectives and Principles, Test Case Design. Approaches to Software Testing, Black Box testing and White Box testing.
Testing Process: Comparison of Different Techniques, Levels of Testing, Test Plans, Test Case Specifications, Test Case Execution and Analysis.

Software Reliability, Software Maintenance, Software Quality Assurance & International Standards, Clean Room Software Engineering, CASE Tools, The Road Ahead.

TEXT BOOKS :

1. Pankaj Jalote 　　　　　　　　　　　:　　An Integrated Approach to Software Engineering, 3nd Edition, Narosa.

2. Roger S. Pressman :Software Engineering : A Practioner's Approach, 6th Edition, McGraw Hill International student Edition.

REFERENCE BOOKS :

1. Fairley, R.E.　　　 : Software Engineering Concept, Mc-Graw Hill 1985.
2. Sommerville, I.: Software Engineering, Narosa.
3. Shooman, M.: Software Engineering, Mc-Graw Hill.
4.Robert N. Charett　 : Software Engineering Environments, McGraw Hill International Edition.
5.Anderson　　　　 : Software Engineering
　　ISO-9001, "Quality system - Model for quality Assurance in design/ development, production, installation and Servicing".

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SYLLABUS (IIIrd-SEMESTER)

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COURSE CSM-3304: Data Communications & Computer Networks

OBJECTIVES OF THE COURSE

- To introduce the concepts, terminologies and technologies used in data communication and computer networking.
- To study and analyze the of OSI and TCP/IP Protocol Suites
- To be familiar with the data transmission processes, transmission media and tools
- To get familiarized with different routing protocols, congestion control protocols and network performance issues
- To help students in understanding the concepts, establishment and administration of LAN.

- **Credit : 04**
- **Sessional Marks : 30**
  Final Marks : 70

UNIT-I   Introduction to Computer Networks: Evolution of Computer Networks; Networks goals, uses and applications; Network Hardware and Software; Protocol Hierarchies, Design issues for the Layer; Reference Models: OSI and TCP/IP; Example Networks-Internet, ARPANET, NSFNET; Connection Oriented Networks: X.25, Frame Relay, and ATM.

UNIT-II   Fundamentals of Data Transmission: Data Transmission systems and Operations; Encoding: Standard Encoding Schemes; Line Coding Schemes-Unipolar, Polar and Bipolar; Encoding of Digital Data into Analog Signal-ASK, FSK, PSK, QAM; Encoding of Analog Data into Digital Signals-PCM, DPCM, DM; Encoding and Correction Techniques; Multiplexing-TDM, FDM, STDM, WDM, DAM, CDMA; Techniques; Multiplexing-TDM, FDM, STDM, WDM, DAM, CDMA; Transmission Media: Magnetic media, Twisted wire-pair, Co-axial Cabler Fibre optics; Wireless media-Radio and Microwave Transmission; Satellite Communication; Terminal Handling-Polling Techniques; Switching-Message, Circuit and Packet switching; Serial and Parallel Transmission-Asynchronous and Synchronous Transmission;

UNIT-III   Routing Algorithms: Introduction and Classification of R.A.; Properties of R.A.; Optimality Principle; Shortest Path Routing; Multipath (MPA); Centralized Routing; Hot Potato; Flooding; Distributed-Distance Vector Routing; Link State Routing; Routing in Ad Hoc Networks, etc. Congestion: Congestion Control Algorithms, General Principle of Congestion Control; Congestion Prevention Policies; Congestion Control in Virtual Circuit Subnet

and Datagram Subnet; Techniques for achieving good quality of service (QoS). Networks Performance Issues.

UNIT-IV   Local Area Networks**:** IEEE-802 Standards**;** Channel Allocation Schemes in LANs and MANs -ALOHA, CSMA; Wireless LAN Protocols-MACA and MACAW; Popular LAN Technologies- Ethernet, Token Ring, ARCNet, ATM LANs etc; Wireless LANs-802.11 Protocol Stack; Broadband Wireless -802.16; Bluetooth; Internetworking-Bridges, Switches, Routers and Gateways; Virtual. LANs.

<u>BOOKS</u>:

1. Tanenbaum, A.S., Computer Networks, 4th Edition, PHI
2. Stallings, W., Data and Computer Communication, 8th Edition, PHI
3. Kurose, J.F., Ross, K.W., Computer Networking, Pearson Education
4. Forouzan, B. Data Communications and Networks, TMH
5. Forouzan, B. Local Area Networks, TMH.
6. James Martin, Satellite Communication System.
7. W.Tomasi, Introduction to Data Communications and Networking, Pearson Education

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SYLLABUS (IIIrd-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)

COURSE CSM-3305: Microprocessor: Architecture and Applications

OBJECTIVES OF THE COURSE

- The objective of the course is to expose to the students to the architecture and instruction set of typical 8-bit microprocessor. It also deals with Assembly Language Programming using a macro-assembler. Input-output techniques and important programmable support chips used in microprocessor-based systems are discussed in detail.

Credit : 02
Sessional Marks : 30
Final Marks : 70

UNIT-I
Introduction of Microcomputer System:
CPU, I/O devices, clock, memory, bussed architecture, tristate logic, address bus, data bus and control bus.

Architecture of 8-bit Microprocessor: Intel 8085A microprocessor, programmer's model, pin description and internal architecture. 8085 Machine Cycles, state transition diagram.

UNIT-II
Instruction Set:
Addressing modes, Instruction formats of 8085, Data transfer arithmetic, logical, branch, stack and machine control groups of instruction set, 8085 based assembly level programs.

UNIT- III
Interrupts:
Interrupts structure of 8085A microprocessor, processing of vectored and non-vectored interrupts, restart instructions. Data transfer schemes:- DMA mode of Data transfer, Programmed Data transfer. Interrupt Driven Data transfer schemes,

UNIT- IV
Support Chips:
8155, 8355, 8253, pin configuration and programming.

References:

1. Gaonkar R. S., *"Microprocessor Architecture Programming and Applications", 5th Ed., Penram International, 2007.*
2. Short k. l., *"Microprocessors and Programmed Logic",* 2nd Ed., Pearson Education, 2008.
3. Hall D. V., *"Microprocessor and Interfacing-Programming and Hardware",* 2nd Ed., Tata McGraw-Hill Publishing Company Limited, 2008.

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SYLLABUS (IIIrd-SEMESTER)

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COURSE CSM-3306: Discrete Mathematics

OBJECTIVES OF THE COURSE

- To learn discrete mathematical structures, mathematical logic and graph theory.

NOTE: Laboratory should be an integral part of the course.

Credit : 02
Sessional Marks : 30
Final Marks : 70

UNIT: I
Set Theory and Mathematical Logic:
Set Theory: Review of set theory, Relations and Functions, Group, Monoid, Field, Ring. Mathematical Logic: Propositions, connectives, conditional and bi-conditional, well formed formulas, tautologies, equivalence of formulas, duality law, normal forms, inference theory for propositional calculus, Predicate Calculus, Inference theory of the predicate calculus.

UNIT: II
Order Relations and Structures, Recurrence Relation:
Relations and Functions, Partially Ordered Sets and Lattice, Hasse Diagram, Topological Sorting. Recurrence Relation, Recurrence relations using substitution and characteristic roots method, Solutions of recurrence relation using generating function.

UNIT: III
Graph Theory-I:
Formal definition of graphs, Directed and undirected Graphs, Sub-graph, Isomorphism, Circuit Connectivity, Eulerian and Hamiltonian paths and circuits, Elements of Transport Networks, Flows in Networks. Cut sets.

UNIT: IV
Graph Theory-II:
Covering and Matching-Basics, Matchings in bipartite graphs, Perfect matchings, Vertex Colourings- Chromatic number and cliques, Colouring Algorithms.

BOOKS:

1. Discrete Mathematical Structures for computer science By Kolman, Busby (PHI)
2. Theory of Computer Science By K.L.P. Mishra and N.Chandrasekaran, (PHI)
3. Elements of Discrete Mathematics By C. L. Liu, Mc Graw-Hill International
4. Discrete Mathematics for Computer Scientists By JoY L. Mott., Abraham Kandel, Theodore P. Baker Publisher : Reston, A Prentice Hall Company
5. Discrete Mathematical Structures for Computer Science By Bernard Kolman and Robert C. Busby, Eastern Economy Edition (PHI)
6. Discrete Mathematics By Olympia Nicodemmi, CBS Publication
7. Discrete Mathematical Structures with Applications to Computer Science By J.P. Tremblay and R. Manohar, (McGraw-Hill)

References:

1. D.E. Knuth ―The Art of Computer Programming‖ (3rd ed.), Vol. 1, Addison Wesley, 1997
2. K.D. Joshi ―Foundations of Discrete Mathematics‖ New Age International Publishers, 2003
3. D.S. Malik and M.K. Sen ―Discrete Mathematical Structures: Theory and Applications‖ Thomson Learning, 2004
4. R.L. Graham, D.E. Knuth, O. Patashnik ―Concrete Mathematics‖ (2nd ed.), Addison-Wesley, 1994.

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COURSE CSM-3371: Laboratory Course-III

<u>OBJECTIVES OF THE COURSE</u>:

• To develop window based applications using Visual Programming techniques.

Credit : 04
Sessional Marks : 40
Final Marks : 60

<u>LAB:</u>

Beside completing the subject/Lab assignments, the students will be required to complete one mini project as follows:

1. MINI-PROJECT in VB, VC++ or Java under Linux (UNIX)/Windows

   In addition to completing Mini-Project, the students will be doing the exercises provided by the respective teachers in their class rooms. The individual teachers who are teaching the courses will be responsible for completing their respective lab assignments.

Some of the representative areas/problems may include the following:
   • Developing Window Based Applications using recent technologies using .NET Platform or Java Technologies like Java Servlet, Java Beans, COM, CORBA etc.
   • Students should learn languages such as PROLOG or LISP to solve the Laboratory exercises.
   • An expert system shell such as IITM rule be used to create a small expert system for, say, trouble shooting moped, VCR etc. Some suggested experiments are : Tour of India, Stable marriage problem, Game playing (such as bridge), coin change problem etc.

<u>NOTE:</u>

   • Students are advised to consult the ***LAB MANUAL*** of CSM-3071 for details related to Mini-Project development.

<u>Books</u> :
   1. Robert Lafore, *"Object Oriented Programming in C++"*, Pearson
   2. R. Brown, *"Visual Basic .NET – Your Visual Blueprint for Building Versatile Programs on the .NET Framework",* Wiley Publishing, Inc.
   3. Ivan Bayross, "Oracle", BPB
   4. E.N. Mackay, "Developing user Interfaces for Windows", WP Publishers & Distributors Pvt. Ltd.

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SYLLABUS (IVth-SEMESTER)

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COURSE CSM-4401: Network Programming

OBJECTIVES OF THE COURSE:
- To learn the techniques of internet programming.

NOTE:

1. In all four questions are to be set; at least one from each unit. At least 1/3 more sections are to be set for choice within each unit.
2. Laboratory should be an integral part of the course.

Credit: 04
Sessional Marks: 30
Exam Marks: 70

UNIT-I   Internetworking with TCP/IP: Overview of TCP/IP Protocol stack; Network Interface layer Protocols -ARP, RARP, BOOTP, DHCP, ATMARP; Internet layer-IP, IP-Addresses -Network and Host IDs, Subnetting, Masking; IP Datagram, ICMP, IGMP; Overview of Routing in the Internet : RIP – Routing Information Protocol, OSPF – The Interior Gateway Routing Protocol; BGP – The Exterior Gateway Routing Protocol; Multicasting.

UNIT-II   Transport Layer : TCP and UDP; Reliable Vrs Unreliable delivering; Connectionless and Connection-Oriented Data Transfer; Connection Establishment in TCP; Sliding Window Protocol, TCP Congestion Control, Slow Start Algorithms; Application Layer Protocols of TCP/IP: Port numbers; Client-Server Model of Interaction, TELNET, DNS, SMTP; SNMP; FTP; E-Mail; The Future of TCP/IP; IPv4 Vrs IPv6.

UNIT-III   Introduction to Network Programming: Unix I/O Paradigm and Network I/O; Adding Networks I/O to Unix; The Socket Abstraction; Creating Socket, Socket Inheritance & Termination; Specifying a Local Address; Connecting Sockets to Destination Addresses; Sending and Receiving Data through Sockets; Obtaining local and remote Socket Addresses; Accessing the Domain name system; Obtaining Information about Hosts, Networks, Protocol and Services; Client-Server Programming, Socket Programming with TCP and UDP.

UNIT-IV   Application Development: Design of file transfer protocol, remote log-in protocol etc. using socket interface. Communication Security- IPsec, Firewalls, VPNs; Wireless Security-802.11 Security, (WEP), Bluetooth Security, WAP Security.

References :

1. Internetworking with TCP/IP Vol. I,II,&III   By D.E. Comer,3rd Edition, PHI

2. TCP/IP Illustrusted   Vol. I,II,&III   By W. Richard Stevens, Addison Wesley, Bragg, Rhodes-ousley, Strassberg, et.al

3. Network Security-The Complete Reference   TMH, A.S. Tanebaum, 4th Edition, PHI

4. Computer Networks

5. Data Communication and Networks   Forouzan B., 3rd Edition, TMH

6. Adventures in UNIX Network Applications Programming, Bill Rieken and Lyle Weiman,John Wiley & Sons, 1992.

<u>SYLLABUS (IVth-SEMESTER)</u>

<u>MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA)</u>

COURSE CSM-4402: Theory of Computation

<u>**OBJECTIVES OF THE COURSE:**</u>
- Obtain understanding of the concepts of Theory of Computation.
- Obtain understanding of what Computer can do and what can't.

<u>**NOTE**</u>:
1. In all four questions are to be set; at least one from each unit. At least 1/3 more sections are to be set for choice within each unit.
2. Laboratory should be an integral part of the course.

Credit: 04
Sessional Marks: 30
Exam Marks: 70

UNIT-I   **Mathematical Preliminaries and Finite Automat:** Sets, Functions and Relations, Graphs and Trees, Proof Techniques; Languages, Grammars, Finite Automata: Deterministic Finite Automata and Nondeterministic Finite Automata, Equivalence of Deterministic Finite Automata and Non Deterministic Finite Automata, Mealy and Moore Models: Finite Automata with outputs, Procedure for transforming Mealy Machine to Moore Machine and Moore Machine to Mealy Machine; Minimization of Finite Automata.

UNIT-II   **Regular Languages and Regular Grammars:** Regular expressions; Formal Definition of a Regular Expression, Languages associated with regular expressions, Connection between Regular Expression and Regular Languages; Finite Automata and Regular Expression; Regular Grammar; Properties of Regular Languages: Closure properties of Regular languages, Identifying Non-regular languages.

UNIT-III: **Context Free Languages and Pushdown Automata: Context** Free Grammars, Examples of Context Free Languages, Left most and right most Derivations, Derivation Trees, Relation between sentential forms and Derivation Trees; Methods for transforming Grammars; An useful Substitution Rule, Removing useless productions, Removing λ-productions, Removing unit productions; Two important Normal Forms: Chomsky Normal Forms-Greibach Normal Form; Nondeterministic Pushdown Automat: Definition of a Pushdown Automata, The Language Accepted by a Pushdown Automata; Pushdown Automata and Context-Free Languages: Pushdown Automata for Context-Free Languages, Context-Free Grammars for Pushdown Automata; Deterministic Pushdown Automata and Deterministic Context-Free Languages; Grammars

for Deterministic Context-Free Languages; Pumping Lemma for Context-Free Languages; Closure of Context-Free Languages.

UNIT-IV   **Turing Machine and their Languages:** The Standard Turing Machine: Definition of a Turing Machine, Turing Machine as Language Accepters; Other Models of the Turing Machine: Multi-tape Turing Machines, Multidimensional Turing Machines, Nondeterministic Turing Machines, The Universal Turing Machine.

BOOKS:

1. Linz, P. An introduction to formal languages and automata. Jones & Bartlett Publishers.
2. Mishra, K.L.P. Theory of Computer Science. PHI
3. Lewis, H. R., & Papadimitriou, C. H. Elements of the Theory of Computation. Prentice Hall PTR
4. Martin, J. C. Introduction to Languages and the Theory of Computation, New York: McGraw-Hill.
5. Sipser, M. (2012). Introduction to the Theory of Computation. Cengage Learning.

DEPARTMENT OF COMPUTER SCIENCE ALIGARH
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SYLLABUS (IVth-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATION (II-YEAR)

COURSE CSM-4403: CYBER SECURITY

OBJECTIVES OF THE COURSE

- To sensitize and establish the 'fundamental concepts and principles of cyber security'**.**
- To introduce and explain cryptography and its applications in maintaining information security.
- To introduce and explain Network and Internet security and its mitigation.
- To develop an understanding of 'web-based threats and counter measures'
- To develop an understanding of 'malicious attacks, threats, and vulnerabilities'

Credit: 04
Sessional Marks: 30
Exam Marks: 70

UNIT: I
Cyber Security Concepts: Introduction to cyber security, Types of cyber security, Information Assurance Fundamentals, Attacker Techniques and Motivations, Cyber security Challenges, Incident response process, Security policy, Risk Analysis and Management, Cybercrime and Law: Introduction, Cybercrime and Information security, Cyber criminals, Classification of cybercrimes, Legal perspective of cybercrimes, planning cyber attacks by cybercriminals, Cyber Law, Indian IT Act, Careers in Cyber security.

UNIT: II
Data Security: Symmetric Ciphers: Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard, Basic Concepts in Number Theory and Finite Fields, Advanced Encryption Standard, Block Cipher Operation; Asymmetric Ciphers: Number Theory, Public-Key Cryptography and RSA, Other Public-Key Cryptosystems, Quantum Cryptography: Quantum Physics Photon Reception, Cryptography with Photons, Implementation, Cryptographic Hash Functions, Message Authentication Codes, Digital Signatures.

UNIT: III
Network and Internet Security: Network Security Concepts, Network Access Control and Cloud Security: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control, Cloud Security Risks and Countermeasures, Data Protection in the Cloud, Cloud Security as a Service; Transport-Level Security, Wireless Network Security: Threats and its counter measures, Electronic Mail Security, IP Security: IP Security Protocol Suite (IPsec), Bots, Botnets, Firewall and Packet Filters, Password Cracking, Key loggers and Spyware, DoS and DDoS attack

UNIT: IV

Software and Web Threats: Programs and Programming Unintentional (Non-malicious) Programming: Oversights, Buffer Overflow, Incomplete Mediation, Time-of-Check to Time-of-Use, Integer Overflow, Unterminated Null-Terminated String, Race Condition. Web Application security, Web vulnerabilities scanning tools: Nikto, W3af etc., Application inspection tolls: Sql map, DVWA etc., Core Defense Mechanisms, Bypassing Client-Side Controls, Attacking Authentication, Attacking Session Management, Attacking Access Controls, Attacking Data Stores, Attacking Back-End Components, Attacking Application Logic, Attacking Users: Cross-Site Scripting and other Techniques, Exploiting Information Disclosure.

TEXT BOOKS:

1. Sunit Belapure Nina God bole, "**Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives**", Wiley India Private Limited.
2. William Stallings, "**Cryptography and Network Security: Principles and Practice**". Pearson Publication.
3. Dafydd Stuttard, Marcus Pinto, "**The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws**", Second Edition, John Wiley & Sons, Inc.
4. Merkow& **Breithaupt**, **"Information Security: Principles and Practices"**, 2nd Edition, 2014, Pearson.
5. Mike Shema, "**Anti-Hacker Tool Kit**" McGraw-Hill Education.

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SYLLABUS (IVth-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA-IInd Year)

COURSE CSM-4404: Computer Graphics

OBJECTIVES OF THE COURSE

- To introduce the concepts of Computer Graphics
- To develop an understanding of transformation, rotation and scaling of images
- To have a basic understanding of OpenGL.

Credit: 02
Sessional Marks: 30
Exam Marks: 70

UNIT-I

Introduction, fundamentals, Classification of Computer Graphics, Advantages of Computer Graphics; Raster Scan and Random Scan, graphics storages, displays processors and character generators, colour display techniques. Beam penetration and shadow-mask color displays.

UNIT-II

Graphics primitives, points and lines, Line drawing algorithms, Criteria for good Computer generated lines; Simple DDA and Symmetric DDA; Bresenham algorithm; Curve, Circle generation. 2D viewing and clipping, point clipping, line clipping, Cohen Sutherland line clipping algorithm, polygon clipping algorithm of Sutherland and Hodgman, viewing transformations

UNIT-III

2-Dimensional transformations: Translation, Rotation and Scaling. Matrix Formulation of transformations and concatenation. 3D representation, transformations, perspective and parallel projections. Fractals: Generation, Classification and Dimension. Some basic fractal images-Koch curve, Spearpinski triangle, Mandelbort and Julia sets.

UNIT-IV

Computer Graphics Tool- OpenGL: Introduction, Objectives of OpenGL, Installing OpenGL, Running an OpenGL Application, Basics of OpenGL, OpenGL Primitives, Line, Curve, circle, Implementation of clipping algorithm, Implementation of transformations and viewing.

TEXT BOOKS:

1. Newman W.M. & Sproull R.F. – "Principles of Interactive Computer Graphics"- Mc-Graw Hill Ed. II (1979)
2. Foley J.D. & Van Dam- "Fundamentals of Interactive Computer Graphics". Addison Wesley (1982)

Reference Books:

1. Harrington – Computer Graphics-Mc-Graw Hill (1987)
2. Giloi, W. – Interactive Computer Graphics-Data structure and Algorithms Prentice-Hall 1978.
3. Hearn D. & Baker-Computer Graphics-Prentice Hall of India, New Delhi (1990)

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<u>SYLLABUS (IVth-SEMESTER)</u>

<u>MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA-IInd Year)</u>

COURSE CSM-4411: Linux Administration and Shell Programming

<u>OBJECTIVES OF THE COURSE</u>

- To introduce the internals of Linux Operating System.
- To develop, debug and implement Shell Programme.

<u>NOTE</u>:
1. In all four questions are to be set; at least one from each unit. At least 1/3 more sections are to be set for choice within each unit.
2. Laboratory should be an integral part of the course.

Credit: 04
Sessional Marks: 30
Exam Marks: 70

UNIT-I   Importance of Linux/Unix, overview of Linux/Unix operating System, Linux editors: Vi, pico etc; Linux shell, command line structure, essential Linux commands to work in Linux environment, jobs and process management, Linux file system , Linux system calls, Linux process creation and execution, Inter process communication (pipes and signals). IPC using shared memory.

UNIT-II   **Shell programming:**
Need of Shell programming, types of Shells in Linux/Unix, Shell variables**:** User Defined Variables, environment variables, predefined variables, reading values into user defined variables, command substitution computation on shell variable , handling shell variables, passing arguments to the shell, shift command, conditional execution operators, conditional statements , test command, Iterative statements : for, while, until, break, continue statements ,   practical examples on shell programming. Exercises on shell programming.

UNIT-III   **Introduction to Python Programming:**
Structure of a Python Program,   Print   Statements, Suppression of new lines,
Commenting the programs under python, variable reading input from the keyboard, performing basic calculations, operator precedence, escape sequences, formatting the Output, formatting multiple values, Function under Python (Defining and Calling) Decision and interactive structures (Simple Scripts).

UNIT-IV   **System administration & security:**
System administration, common administrative tasks, identifying administrative files configuration and log files, role of system administrator, managing user accounts- adding and deleting users, changing permissions and ownerships, creating and managing groups, modifying group attributes, Temporary disable users account, creating and mounting file system, checking and monitoring system performance, file security and permissions, becoming super user using su.

Text books:

a) Neil Matthew, Richard Stones, "Beginning Linux Programming
   (Linux Programming Series)", Wrox Press.
b) Yashwant Kanitkar, "Unix Shell Programming" , BPB.
c) Ahmad M.I. and Bokhari M.U. "UNIX Operating System" Dhanpat Rai & Co.
d) Parata, "Advanced Unix programming guide", BPB.
e) Sumitabh Das, "Unix Concepts and applications", TMH.
f) Mike Joy, Stephen Jarvis, Michael Luck, "Introducing Unix and Linux", Palgrave Macmillan.

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SYLLABUS (IVth-SEMESTER)
MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA-IInd Year)

COURSE CSM-4491: Fundamentals of Information Technology (Open Elective)

OBJECTIVES OF THE COURSE

NOTE
1. In all four questions are to be set; at least one from each unit. At least 1/3 more sections are to be set for choice within each unit.
2. Laboratory should be an integral part of the course.

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT - I   Computer Hardware: Computer System as Information processing System; Computer System Difference- types of Computer Systems, hardware Option- CPU, Input Devices, Output Devices, Storage Devices, Communication Devices, Configuration of Hardware Devices.

UNIT - II   Personal Computer: PC and its main Components, Hardware Configuration, CPU and Clock Speed, Basics of memory, types of memory, cache and registers, RAM and Secondary Storage Devices, memory management, virtual memory Management, Other Peripherals Used With PC, Factor Influencing PC Performance; PC as a virtual Office.

UNIT - III   Modern Information Technology: basic Ideas of local Area Networks (LAN) and Wide Area Networks (WAN); E-mail; Internet technologies, access devices, Concept of a World Wide Web and Internet Browsing; Multimedia.

UNIT - IV   Introduction to Operating System: Software Need, operating System, Application Software, Programming Language; DOS; Window, Window Explorer, print Manager, Control Panel, Paintbrush, Calculator, Desk Top, My Computer, Setting, Find, Run; UNIX.
Applications of Information Technology: Wide range of applications in; home, education and training, Entertainment, Science, medicine, Engineering etc. its applications are; E- judiciary, E-security, E- legislature, Urban and rural development; E- environment, creating secure wireless network for the military.

Text Book:

Bokhari & Kuraishy "Fundamentals of Information Technology", Dhanpat Rai & Co.

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<u>SYLLABUS (IVth-SEMESTER)</u>

<u>MASTER OF COMPUTER SCIENCE AND APPLICATION (MCA-IInd Year)</u>

COURSE CSM-4471 : Laboratory Course-IV

<u>OBJECTIVES OF THE COURSE</u>
- To learn Linux internals & Shell Programming.
- To design, develop and implement real life application software.

Credit : 04
Sessional Marks : 40
Final Marks : 60

<u>LAB :</u>

Beside completing the subject/Lab assignments, the students will be required to complete one mini project as follows:

1. MINI-PROJECT in RDBMS/Visual Basic/Power builder/D2K

> (**In addition to this they will be doing the exercises** provided by the respective teachers in their class rooms. The individual teachers who are teaching the courses will be responsible for completing their respective assignments).

Some of the representative areas/problems may include the following:

- Designing & Implementing complete information systems using SSAD & OOAD techniques.
- Using CASE tools for analysis, Design & implementation of information systems.
- An expert system shell such as IITM rule be used to create a small expert system for, say, trouble shooting moped, VCR etc. Some suggested experiments are : Tour of India, stable marriage problem, game playing (such as bridge), coin change problem etc.

-
- Unix/Linux internals & shell programming.

<u>Books :</u>
1. C+++ by Lafore, Galgotia
2. Visual Basic - By Tech meida Publication 6.0
3. FoxPro 2.5/2.6 - Michal P. Antonowish, Galgotia
4. Oracle 8.0 - By Ivan Bayross; BPB
5. Developer 2K - By Ivan Bayross; BPB
6. Mastering MS-Visual Basic 6.0 Development: Microsoft press - WP Publishers & Distributors Pvt. Ltd.
7. Developing user Interfaces for Windows - E.N. Mackay WP Publishers & Distributors Pvt. Ltd.
8. Introduction to PROLOG :- by CLOCK SIN and Mellish (1981)
9. Introduction to LISP :- by Narayan & sharkey (1988), E-West Publications TodevelopComputerprogramsinC++/CforimplementingComputerGraphicsalgorithms.

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SYLLABUS (Vth-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-5501: ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING

OBJECTIVES OF THE COURSE
- To introduce the concepts of Artificial Intelligence.
- To learn machine learning techniques in detail.
- To introduce the Soft Computing techniques such as neural networks, fuzzy logic, genetic algorithm etc.
- To apply the AI algorithms on various practical scenarios.

Credit: 04
Sessional Marks: 30
Exam Marks: 70

UNIT-I   **Basics of AI:** Natural and Artificial Intelligence, definitions of artificial intelligence, applications, Underlying Assumptions about intelligence, Physical Symbol System Hypothesis; its importance in AI, AI Techniques, Criteria of success, Control strategies and heuristic search , Problem characteristics, state and search space, Problem Solving Methods: Generate-and–Test, Hill climbing, Breadth-first search and Best-first search, A*, AO*, Games playing-Minimax search procedure, alpha-beta pruning.

UNIT-II   **Machine Learning:** Introduction, Types of machine learning: supervised, unsupervised and reinforcement learning, Supervised learning: Classification: Two class and Multiclass classification, Regression, Decision boundary Techniques: Linear Regression, K-nearest neighbor, Decision Trees: Entropy and information gain, Logistic Regression, Artificial neural network: perception, multilayer perception, back-propagation algorithm, Unsupervised learning: Clustering, Techniques: K-means clustering and Hierarchical clustering.

UNIT-III   **Soft Computing:** Introduction, Hard computing vs Soft Computing, Components of Soft Computing, Evolutionary Computation, Genetic Algorithm, Methods for crossover, mutation, Roulette wheel selection, Tournament selection, Applications of genetic algorithm, Swarm intelligence, Particle swarm optimization, Fuzzy logic: introduction, crisp set vs fuzzy set, Linguistic variables, representation of fuzzy terms, discrete method, piecewise linear method, Fuzziness vs. probability, Fuzzy logic operations, fuzzy rules, Fuzzy inferencing: fuzzification, evaluation, defuzzification, applications of fuzzy logic.

UNIT-IV   **Important concepts and Applications:** Underfitting, Overfitting,

intensification, diversification, linearly separable and non-linearly separable dataset, Training set vs Testing set, Validation set, K-fold cross validation, Data normalization: importance and techniques, Treatment of missing values, Feature significance, Irrelevant features, Performance matrices: classification accuracy, Confusion matrix, recall, precision, error measures. **Applications:** Flower data classification**,** Spam filtering, Handwritten-digit recognition, Readymade cloth grouping. Test functions for optimization, Rastrigin function, Ackley function, Bukin function.

REFERENCES:
1. Elaine Rich : Artificial intelligence-Mc Graw Hill International Book Company, Japan
2. Tom Mitchell: Machine Learning- Mc Graw Hill.
3. S.N. Sivanandam, S.N. Deepa: Principles of Soft Computing, Wiley India; 2 edition.
4. Christopher Bishop: Pattern Recognition and Machine Learning, Springer.

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SYLLABUS (Vth-SEMESTER)

<u>MASTER OF COMPUTER SCIENCE AND APPLICATIONS</u>

COURSE CSM-5502: COMPILER CONSTRUCTION

<u>OBJECTIVES OF THE COURSE</u>
- To develop the understanding of functioning of compilers and enable to write compilers.

<u>NOTE:</u>
1. In all four questions are to be set; at least one from each unit. At least 1/3 more sections are to be set for choice within each unit.
2. Laboratory should be an integral part of the course.

Credit : 04
Sessional Marks : 10
Mid-Sem Marks : 30
Final Marks   : 60

UNIT-I Introduction to assembler, Compiler and linkers, Structure of Compiler, Overview of compilation Process, Compiler writing language, Compiler writing tools .

UNIT-II Programming Languages and grammar, Context free grammar, Ambiguity and Non ambiguity, Role of Lexical analyzer, Finite automat & regular expressions, Transformation of the grammar, Simple approach to design of lexical analyzer.

UNIT-III Parsing : Top-down and bottom up approaches, Syntax Directed Translations-Inherited and Synthesized attributes, Dependency graph, Top Down Parsing Implementation, Predictive Topdown Parser, Recursive decent parsing, Table Driver Parser, Bottom up Parsing Implementation, LR Parser, SLR parser.

UNIT-IV Translation of assignment statement, Boolean expression, Unconditional branching, Conditional branching and looping, Code Optimization-Source of Optimization, Optimization of Basic Blocks, Loops, Error Handling.

<u>BOOKS:</u>
1. Compiler Construction Principle and Practice - D.M. Dhamdhere, Mcmillan India Ltd., Delhi, Bombay, Madras
2. Compilers-Principle, Techniques&Tools   Aho, Ullman & Sethi, 2003, Pearson Education
3. Introduction to Compiling Techniques-   J. P. Bennett

<u>Reference Books:</u>

1. Compiler Design -   O.G. Kakde, Laxmi Pub
2. System Programming & O.S-   D.M. Dhamdhere, Tata McGraw Hill

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SYLLABUS (Vth SEMESTER) MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-5522: MOBILE COMPUTING

OBJECTIVES OF THE COURSE:
- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
- To understand the typical mobile networking infrastructure through a popular GSM protocol
- To understand the ad hoc networks and related concepts.

Credit : 02
Sessional Marks : 30
Final Marks : 70

UNIT-I
Introduction: Mobile computing, Applications, History, Reference model for Mobile Computing, Wireless transmission, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems: 2G, 3G,4G,5G, Medium access control: Hidden and exposed terminals, Near and far terminals, Satellite systems, Routing, Localization

UNIT-II
Telecommunications systems, GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, New data services, DECT: System architecture, Protocol architecture, TETRA, UMTS and IMT-2000: standardization, System architecture, Radio interface

UNIT-III
Broadcast systems, Digital audio broadcasting, Digital video broadcasting, Infrastructure and ad-hoc network, IEEE 802.11: System architecture, Protocol architecture, 802.11a, 802.11b, HYPERLAN, Bluetooth network, Mobile network layer: Mobile IP, Dynamic host configuration protocol, Mobile ad-hoc networks.

UNIT-IV
Mobile transport layer, Traditional TCP, improvements: Indirect TCP, Snooping TCP, Mobile TCP, Transaction-oriented TCP, TCP over 2.5/3G wireless networks, Performance enhancing proxies, Wireless application protocol (WAP): Architecture, protocol stack, application environment, Applications., WAP 2.0, Mobile Security: general issues, hardware and software vulnerabilities and solutions, WEP

REFERENCES:

1. Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
4. William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition,Tata Mc Graw Hill Edition ,2006.
5. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.

DEPARTMENT OF COMPUTER SCIENCE
ALIGARH MUSLIM UNIVERSITY, ALIGARH

SYLLABUS
MCA –V Semester
Course Title: Parallel Computing
Course Number: CSM-5533

OBJECTIVES OF THE COURSE:
- Obtain understanding of the fundamental concepts of parallel computing.
- Obtain understanding of what parallel computers can do.

NOTE: Laboratory should be an integral part of the course.

Credit : 04
Sessional Marks: 30
Final Marks :70

UNIT: I
Introduction: The Need of Parallel Computation; Levels of Parallel Processing; Parallelism in conventional machine, Pipelining, Limitations of Von Neumann Architecture, Flynn's Classification, Structural Classification, Amdahl's Law; Gustafson's Law; Comparison of two laws, efficiency and speed up Curves; performance measures & metrices.

UNIT: II
PRAM machines and Networks models:A model of serial computation, The PRAM model of parallel computation, Parallel Random-Access Machines (PRAM)-EREW, ERCW, CREW, CRCW.
Static and dynamic networks, Single stage and multistage interconnection network, Blocking and nonblocking network, Star, Ring, Mesh, Torus, Pyramid etc. topology, Elementary permutations used in Interconnection network, Crossbar, Clos, Benes network, Shuffle exchange, Hypercube,

UNIT: III
Parallel Programming: Principles of Message-Passing Programming-Send and Receive Operations, MPI: The Message Passing Interface, Overlapping Communication with Computation, Collective Communication and Computation Operations
Programming Shared Address Space Platforms; Thread Basic, The POSIX Thread Application Programme Interface, OpenMP: A Standard for Directive Based Parallel Programming

UNIT: IV
PARALLEL ALGORITHMS: Matrix-multiplication on the 2-D Mesh SIMD model, Matrix-multiplication on the Hypercube SIMD model, Matrix-multiplication on the Shuffle-exchange SIMD model, Algorithms for multiprocessors, Algorithms for multi-computers ; Row-Column-oriented Algorithm, Block-oriented Algorithm;Sorting- Issues in Sorting on Parallel Computers, Enumeration Sort, Lower bounds on parallel sorting, Quick Sort and its Variants, Graph Algorithms -Minimum Spanning Tree: Prim's Algorithm and others.

TEXT BOOKS:

1. Hwang and Briggs, "Computer Architecture and Parallel Processing", McGraw Hill International.
2. Kai Hwang, "Advanced Computer Architecture", McGraw Hill International, 2011
3. Quinn M. J., "Parallel Computing, Theory and practice", Tata McGraw-Hill, New Delhi
4. Saing Soo, YL. Ching, "Parallel processing and parallel Algorithms, springs Publications.
5. M.R. Bhujade, Parallel Computing, New Age International Publications, 2011
6. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar; Introduction to Parallel Computing, 2nd Edition, Addison Wesley.

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SYLLABUS (Vth SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS
COURSE CSM-5541: ADVANCE DBMS AND DBA

OBJECTIVES OF THE COURSE
- To introduce advance concepts of DBMS.
- To understand the distributed structure of Databases
- To introduce various types of Databases

Credit: 04
Sessional Marks : 30
Exam Marks : 70

UNIT-I
Relational database, Limitations of relational database, need of advanced DBMS, Object Oriented Database, Object Relational Databases, Temporal Database concept, Distributed Database Management: Reference Architecture, levels of distribution transparency, Distributed database design, Distributed Query Processing and Optimization, Distributed Transaction Modeling.

UNIT-II
Concurrency control-2 phase locks, Management of Distributed transactions-2 phase unit protocols, open database connectivity, Decision Support System: Online analytical processing; Online transaction processing, Deductive Databases: Introduction and deductive database system, Data log and Recursion, Deductive object oriented database, Parallel Databases: Parallel architectures, shared nothing/shared disk/shared memory based architectures, Data partitioning, pipelining

UNIT-III
Database on the World Wide Web, Mobile databases: Mobile Computing architecture, Characteristics of mobile, environments, Data management issues, Genome databases Management: Biological Sciences & Genetics, Characteristic of Biological data, Existing Biological databases, Knowledge base system, Expert database system

UNIT-IV
Image and Multimedia Databases**:** Modeling and Storage of Image and Multimedia Data, Data Structures – R-tree, k-d tree, Quad trees, Content Based Retrieval: Color Histograms, Textures, etc., Image Features, Spatial and Topological Relationships, Multimedia Data Formats, Video Data Model, Audio & Handwritten Data, Geographic Information Systems (GIS). WEB Database: Accessing Databases through WEB, WEB Servers, XML Databases.

References
1. Date, C.J.,"An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Desai, B., "An Introduction to Database Concepts", Galgotia Publications, New Delhi.
3. Elmsari and Navathe,"Fundamentals of Database Systems", Addison Wesley, New Delhi
4. Ullman, J.D.,"Principles of Database Systems", Galgotia Publications, New Delhi
5. Hansen & Hansen "Database Management & Design" (PHI)
6. James Mortin- Principles of Database Management Object Oriented Modeling & Design

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SYLLABUS (Vth-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-5552: E-COMMERCE

OBJECTIVES OF THE COURSE
- To introduce the concepts of E-Commerce infrastructure
- To understand security concerns in E-Commerce
- To gain technical understanding of Electronic Payment Systems

Credit : 04
Sessional Marks : 30
Final Marks : 70

UNIT-I
Introduction to E-Commerce: Fundamental of e-commerce, Brief history of e-commerce, Impact of e-commerce, Benefits and limitations of e-commerce, Classification of e-commerce: Inter organizational e-commerce, Intraorganizational e-commerce, Business to Business electronic commerce, Business to Customer electronic commerce and Collaborative commerce, Mobile Commerce etc., Applications of e-commerce technologies, E-Commerce Business models.

UNIT-II
E-Commerce Infrastructure: Framework of e-commerce, I-Way Concept, EC Enablers, Review of the Internet structure, the TCP/IP Protocol Suite, The client/server model, Review of the architectural components of World-Wide Web, Proxy servers, Internet call centers, cookies, Agents in e-commerce and their role, Network infrastructure for e-commerce: Intranets and their applications, Extranets and their applications, Virtual Private Networks (VPNs), Internet-based VPNs, Firewalls and their types

UNIT-III
Security in E-Commerce: Issues in Network and Transaction Security, Cryptography and Cryptanalysis, Symmetric and Public Key Cryptographic systems, Authentication protocols, Public Key Infrastructure (PKI), Integrity and Non-repudiation, Digital Certificates, Digital Signatures, Electronic mail security, Security protocols for web commerce: SSL, SET etc.

UNIT-IV
Electronic Payments: Introduction to Money, The nature of money, Overview of electronic payment systems, Limitations of traditional payment instruments, Electronic payment requirements, Micro payments, Online payment systems, Card-based payment systems.

BOOKS:
1. Ravi KalaKota, Andrew Whinston, *"Frontiers of Electronic Commerce",* Addition Wesley
2. Diwan, Sharma, *"E-Commerce",* Excel Asset International
3. Bajaj and Nag, *"E-Commerce: The Cutting Edge of Business",* TMH
4. Denlal Amor, *"The E Business Revolution",* Addition Wesley
5. Sokal, *"From EDI to E-Commerce: A Business Initiative",* TMH
6. Greeanstein and Feinman, *"E-Commerce",* TMH
   7. Bharat Bhasker, *"Electronic Commerce-Framework, Technologies & Applications",* TMH
8. K. C. Laudon and C. G. Traver, *"E-commerce: business, technology, society",* Addison esley
9. David Whiteley, *"E-commerce:Strategies,Technologies and Applications",* TMH
10. P.T. Joseph, *"E-Commerce An Indian Perspective",* Prentice-Hall of India, 2007
11. Norman Sadeh, *"M-Commerce : Technologies, Services & Business Module",* Wiley
12. O' Malinoy Donalad, M.A. Peirce, Hitesh Tiwari, *"Electronic Payment Systems for E-Commerce"*

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SYLLABUS (Vth-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-55P1: LABORATORY COURSE-V

OBJECTIVES OF THE COURSE
- To design, develop and implement real life application software using advanced internet techniques
- To learn fundaments of Network Programming
- To learn using Accounting packages
- To introduce basics of microprocessor programming

Credit : 04
Sessional Marks : 40
Final Marks : 60

LAB:
Beside completing the subject/Lab assignments, the students are required to complete one Mini-Project as follows:

1. MINI-PROJECT using Web Engineering Tools: Design and Implementation of Web Applications, Web Services, Mobile Applications etc. Students are required to incorporate the followings:
> Dynamic Pages, Adding Dynamic Functionality
> Interactive User Interface
> Database in the back-end
> XML and Databases
> Provision for EDIs
> Adding Security Features, etc.

For developing the project, students may use the followings:
> .NET Platform, J2EE Platform, Eclipse
> JAVA, C#,VC++, etc
> Microsoft Front page/Flash/PHP/Dreamweaver etc.
> XML, DHTML, CGI, Scripting Languages (JSP, ASP), or Suitable Technologies.

In addition to this Mini Project students will be doing the exercises provided by the respective teachers in their class rooms. The individual teachers who are teaching the courses will be responsible for completing their respective Lab Assignments.

Some of the representative areas/problems may include the following:
- TCP/IP Programming
- Working with the popular Accounting package e.g. Tally, Ex-Gen etc. and learning Art of making entries, generating various reports like Profit-Loss account, Balance Sheet etc.
- Developing simple Accounting Packages in VB, JAVA or Oracle (D2K) etc.
- Study, Analysis and Design of complete information systems
- Microprocessor Lab

NOTE:

- Students are advised to consult the *LAB MANUAL* of CSM-5071 for details related to Mini-Project development.

SYLLABUS (VIth-SEMESTER)

MASTER OF COMPUTER SCIENCE AND APPLICATIONS

COURSE CSM-6D1 : Project/Dissertation Work

OBJECTIVES OF THE COURSE

- To help students develop openness to new ideas in computer science, develop the ability to draw reasonable inferences from observations and learn to formulate and solve new computer science problems using analytical and problem-solving skills;
- To help students develop the ability to synthesize and integrate information and ideas, develop the ability to think creatively, develop the ability to think holistically and develop the ability to distinguish between facts and opinion;
- To help students acquire the necessary competences to build a real-life software system by completing different software life cycle phases (like, specification, architecture, design, implementation, validation, documentation, etc);
- To help students develop the ability to work individually and as part of a team, develop a commitment to accurate work, develop management skills, improve speaking and writing skills, improve the ability to follow directions, instructions and plans, and improve the ability to organize and use time effectively;
- To help students develop a commitment to personal achievement, the ability to work skillfully, informed understanding of the role of science and technology, a lifelong love of learning, and cultivates a sense of responsibility for one's own behavior and improves self-esteem/self confidence.

Credit : 24
Continuous Assessment: 80
Final Marks : 120

Course Content

This course consists of the ***development of a realistic application***, representative of a typical real-life software system or to carry a research based project in an area related to CS & IT.

1. The students are expected to propose, analyze, design, develop, test and implement a real life software system using recent technologies.
2. In case of a ***research based project***, the students are required to follow a proper research methodology to propose a solution (in terms of a model/framework/algorithm, etc) of a research problem related to computer science and IT.
3. The student will deliver oral presentations, progress reports, and a final report.

A. Depending on the topic of the project and the chosen ***software development*** methodology, the following themes may be addressed to some extent:
- Software development methodologies, static (products) and dynamic aspects (processes);
- Requirement analysis (goals, use cases), software architectures, architectural styles and patterns, model-driven engineering (MDE);

- Programming techniques, software development environments, refactoring;
- Software validation through unit tests, integration tests, functional and structural tests, and code reviews.
- Project management, planning, resource estimation, reporting.
- Version management by using a version management tool.
- Examples of kinds of systems to be developed are distributed systems, client/server systems, web based systems, secure systems, mobile systems, adaptable systems, optimizations of existing systems or data-intensive systems, etc.

B. Typical process of **research based problems** may include, selection of a research topic followed by an extensive literature survey with an aim to find the research gap. Proposing a solution based on the findings (i.e., research gap) and publishing the research work.