SCHEME & SYLLABUS

(Choice Based Credit System)
For

Master of Computer Applications

(w.e.f. Session 2020-21)

Syllabus (Session: 2020-2021)

Department of Computer Science & Application

RIMT UNIVERSITY, MANDIGOBINDGARH, PUNJAB

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SECTION 1
Vision & Mission of the University

VISION

To become one of the most preferred learning places and a centre of excellence to promote

and nurture future leaders who would facilitate the desired change in the society.

MISSION

- To impart teaching and learning through cutting-edge technologies supported by the

  world class infrastructure

- To empower and transform young minds into capable leaders and responsible citizens

  of India instilled with high ethical and moral values.

- To develop human potential to its fullest extent and make them emerge as world class

  leaders in their professions and enthuse them towards their social responsibilities.

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SECTION 2
Vision and Mission of the Department

VISION

Strives to groom students with diverse backgrounds into competitive software professionals with moral values and committed to build a vibrant nation.

MISSION

- To provide a strong theoretical and practical background across the computer science discipline with an emphasis on software development.

- To provide technical solutions in the field of Information technology to the local society.

- To provide need-based quality training in the field of Information Technology.

- To provide students with the tools to become productive, participating global citizens and life-long learners.

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SECTION 3

Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PROGRAM EDUCATION OBJECTIVES (PEO)

PEO1	Demonstrate analytical and design skills including the ability to generate creative solutions and foster team-oriented professionalism through effective communication in their careers.
PEO2	Graduates would expertise in successful careers based on their understanding of formal and practical methods of application development using the concept of computer programming languages and design principles in national and international level.
PEO3	Exhibit the growth of the nation and society by implementing and acquiring knowledge of upliftment of health, safety and other societal issues.
PEO4	Implement their exhibiting critical thinking and problem- solving skills in professional practices or tackle social, technical and business challenges

PROGRAM OUTCOMES (PO)

Program Credits	**101**
Number of Semesters	Total 4 semester in 2 years
Program Outcomes(PO): on successful completion of this Program, the learner will be able to:	
PO1	*Disciplinary knowledge:* Apply the knowledge of mathematics, science, computing fundamentals, and a Computing specialization to the solution of complex problems.
PO2	*Problem analysis:* Identify, formulate, review research literature, and analyse complex computing problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences.
PO3	*Design/development of solutions:* Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern Computer Science and IT tools including prediction and modelling to complex computing activities with an understanding of the limitations.

PO6	**The Computer professional and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional computing practice.
PO7	**Environment and sustainability:** Understand the impact of the professional computing solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the computing practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex Computing activities with the Computer Science community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the Computer Science and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

Program Specific Outcomes(PSO's): on successful completion of this Program, the learner will be able to:

PO1	**Knowledge of Computing Systems:** An ability to understand the principles and working of computer systems.
PO2	**Project Development Skills:** An ability to understand the structure and development methodologies of software systems.
PO3	**Software Development Skills:** Familiarity and practical competence with a broad range of programming language and open-source platforms.
PO4	**Mathematical Skills:** An ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm.

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SECTION 4

Curriculum / Scheme with Examination Grading Scheme

SEMESTER WISE SUMMARY OF THE PROGRAMME:
(MCA)

S. No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	33	700	26.5
2.	II	33	700	26.5
3	III	33	700	24
4	IV	33	700	24
	Total	142	**2800**	**101**

EXAMINATION GRADING SCHEME

Marks Percentage Range	Grade	Grade Point	Qualitative Meaning
80-100	O	10	Outstanding
70-79	A+	9	Excellent
60-69	A	8	Very Good
55-59	B	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Fail
0-39	F	0	Fail
ABSENT	AB	0	Fail

Percentage Calculation: CGPA *10

FIRST SEMESTER

Course		Contact Hours/Week			Credit	Contact Hrs.	Evaluation Scheme (% of Total Marks)			Exam Duration (Hours)
Course Code	Course Title	L	T	P			Internal	External	Total	
MCA1101	Internet & Web Designing	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1102	Programming in C	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1103	Discrete Mathematics	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1104	AI & Machine Learning	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1105	System Analysis & Design	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1106	S/W LAB-I (Internet & Web Designing)	0	0	4	2	4	60	40	100	3 Hrs
MCA1107	S/W LAB-II (C Language)	0	0	4	2	4	60	40	100	3 Hrs
Total					26.5	33			700	

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SECOND SEMESTER

Course		Contact Hours/Week			Credit	Contact Hrs.	Evaluation Scheme (% of Total Marks)			Exam Duration (Hours)
Course Code	Course Title	L	T	P			Internal	External	Total	
MCA1201	Object Oriented Programming Using C++	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1202	Relational Database Management System	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1203	Advanced Data Structure	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1204	Software Engineering	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1205	Computer Organization and Architecture	4	1	0	4.5	5	40	60	100	3 Hrs
MCA1206	S/W LAB-III (C++)	0	0	4	2	4	60	40	100	3 Hrs
MCA1207	S/WLAB-IV (MYSQL/SQL)	0	0	4	2	4	60	40	100	3 Hrs
					26.5	33			**700**	

THIRD SEMESTER

Course		Contact Hours/Week			Credit	Contact Hrs.	Evaluation Scheme (% of Total Marks)			Exam Duration (Hours)
Course Code	Course Title	L	T	P			Internal	External	Total	
MCA2301	JAVA Programming	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2302	Operating	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2303	Data Warehouse & Mining	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2304	Open Elective-I	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2305	Minor Project	0	0	4	2	5	40	60	100	3 Hrs
MCA2306	S/W LAB – V (Java)	0	0	4	2	4	60	40	100	3 Hrs
MCA2307	S/W LAB – VI (Linux)	0	0	4	2	4	60	40	100	3 Hrs
					24	33	33		700	

FOURTH SEMESTER

Course		Contact Hours/Week			Credit	Contact Hrs.	Evaluation Scheme (% of Total Marks)			Exam Duration (Hours)
Course Code	Course Title	L	T	P			Internal	External	Total	
MCA2401	Interactive	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2402	System Software	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2403	Advanced JAVA	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2404	Python	4	1	0	4.5	5	40	60	100	3 Hrs
MCA2405	S/W LAB-VII	4	1	0	2	5	40	60	100	3 Hrs
MCA2406	Major Project	0	0	4	2	4	60	40	100	3 Hrs
MCA2407	Project Training	0	0	4	2	4	60	40	100	3 Hrs
					24	33			700	

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SECTION 1
Detailed Syllabus with Course Outcomes

SYLLABUS
SEMESTER-I

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SUBJECT TITLE: Internet & Web Designing
SUBJECT CODE: MCA1101
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective:
- To introduce the fundamentals of Internet, and the principles of web design.
- To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- To develop modern interactive web applications using PHP and XML.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	WWW concepts, Client/Server Computing, Web Servers and Clients, Web Browsers, A Systematic approach to Website creation, Client side and server side scripting, Creating interactive and dynamic web pages.	7
II	**Java script:** Introduction, documents, forms, conditional and looping statements, functions, object, Form validation, Event and event handling; Browsers and the DOM, JQuery: Syntax, Selectors, Events and AJAX methods.	8
III	**XML building blocks:** Elements, Attributes and Values, Document, comment, DTD building blocks, DTD types, XML Namespaces, XML schemes, Presenting XML with CSS and XSLT, XML-DOM, What is XHTML?	10
IV	**PHP:** Introduction, requirements, WAMP Server, PHP syntax, data type, variables, strings, operators, if-else, control structure, switch, array, function, file handling, form, sending email, file upload, session/state management, error and exception, PHP Database for dynamic Web pages.	15

Suggested Books:

SI. No.	Name of Books / Authors	Year of Publication
1.	Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML and AJAX blackbook, Wiley.	
2.	Web Enabled Commercial Application Development Using HTML, ,JavaScript, DHTML and PHP by Ivan Bayross BPB Publication	
3	James Lee, Brent Ware , "Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP" AddisonWesley, Pearson 2009	2009

Course Outcomes:
- Explain the internet and website creation concepts that are vital in understanding web development.
- Demonstrate the important HTML tags for designing static pages and separate design from content

using Cascading Style sheet.
- Gain insight of concepts of Javascript to develop web applications.
- Hands on practice on PHP and XML and learn the need and basics of CSS and the concepts of Client Side JavaScript.
- Describe the usage of Client Side and Server Side Scripting in web development.

SUBJECT TITLE: Programming in C
SUBJECT CODE: MCA1102
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

CourseObjective:

- To learn C Programming basics and the fundamentals of C
- To learn the basics of Control statements.
- To enhance problem solving and programming skills by implementing Functions, Arrays, Pointers, File management and dynamic memory allocation.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	Program and Programming Language, History of C, Salient Features of C, Structure of a C Program, Writing and compiling a Simple C Program, Syntax and Semantic Errors, Execution Process . Character Set, Identifiers and Keywords, Rules for Forming Identifiers, Data Types and Storage, Data Type Qualifiers, Variables, Constants, enum Assignment Statements, Arithmetic Operators, Relational Operators, Logical Operators, Comma and Conditional Operators, Type Cast Operator, Size of Operator, Priority of Operators	10
II	Decision Control Statements- if, if-else, if -elseif, switch Statement, Loop Control Statements- While, do-while, for, Nested Loop, Goto Statement, Break Statement, Continue Statement Array Declaration, Array Initialization-Initialization of Array Elements in the Declaration, Character Array Initialization, Subscript, Processing the one dimensional Array, 2D Arrays- Declaration , Initialization and processing, Multi-Dimensional Array Declaration, Initialization and processing, Declaration and Initialization of Strings, Display of Strings Using Different Formatting Techniques, Array of Strings, Built-in String Functions and Applications Functions : Definition of a Function, Declaration of a Function, Function Prototypes, Return Statement, Types of Function Invoking- Call by Value and Call by reference, Recursion, Macros vs Functions Storage Classes- Automatic, External, Static, Register	10

III	Declaration of Structures, Accessing the Members of a Structure, Initializing Structures, Structures as Function Arguments, Structures and Arrays Unions-Initializing an Union, Accessing the Members of an Union Pointers and their Characteristics, Address and Indirection Operators, Pointer Type Declaration and Assignment-Pointer to a Pointer, Null Pointer Assignment, Pointer Arithmetic, Passing Pointers to Functions Arrays and Pointers, Array of Pointers, Pointers and Strings	10
IV	C Preprocessor like define, include, ifdef , Other Preprocessor Commands. File Handling in C Using File Pointers, input and Output using file pointers, Sequential Vs Random Access Files	10

Suggested Books:

SI.No.	Name of Books / Authors	Year of Publication
1.	Balagurusamy, "Programming in C", 5th Edition, Tata McGraw-Hill Education, 2007	2007.
2	YashavantKanetkar, "Let us C", 10th Edition, BPB publication, 2010	2010
3	Kerighan& Richie The C programming language (PHI Publication)	2002

Course Outcomes:
- Develop basic understanding of computers, the concept of algorithm and algorithmic thinking.
- Develops the ability to analyze a problem, develop an algorithm to solve it.
- Understand the fundamentals of C programming.
- Choose the right control statement based on the requirementsof the problem.
- Implement different Operations on arrays, functions, pointers,structures, unions and files.

SUBJECT TITLE: Discrete Mathematics
SUBJECT CODE: MCA1103
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of course: To provide basic knowledge about mathematical structures required for variouscomputer science courses.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets. Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, equivalence relation, partial ordering relation. Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.	10
II	Group and Subgroup: Group axioms, Semi groups, Subgroups, Abelian group, Cosets, Normal subgroups, cyclic groups, Permutation Groups, Rings and Fields: definition and standard results, Representation of special languages and grammars, finite state machines.	10
III	Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, and complemented lattices. Boolean Algebra: Basic definitions, Sum of Products and Product of Sums, Form in Boolean Algebra, Logic gates and Karnaugh maps, Applications(Switching circuits, Gate circuits).	10
IV	Graphs: Simple graph, multi graph, Directed and undirected graphs, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs.	10

Suggested Books:

SI.No.	Name of Books / Authors	Year of Publication
1.	Trambley, J.P. and Manohar,R: Discrete Mathematical Structures with Applications to Computer Science.	2001
2	Liu C.L.: Elements of Discrete Mathematics.	2003
3	Alan Doerr and Kenneth Levasseur: Applied Discrete Structures for Computer Science.	2002

Course Outcomes:
- To utilize the inclusion-exclusion principle, solve problems by applying set operations and using Venn

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diagrams.
- To apply basic counting principles such as the product and sum rules, permutations, combinations, the pigeon-hole principle, and binomial expansion to solve counting problems.
- To find the connectedness of a graph, as well as the simpleness, complexity, direction, cyclicity, and acyclicity of a given graph.
- To use adjacency lists and adjacency matrices to represent a graph, and use graph theory to solve practical problems like computer networks.
- To apply the principles of Boolean algebra to circuits and gating networks to evaluate Boolean functions and simplify expressions.

SUBJECT TITLE: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
SUBJECT CODE: MCA1104
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of course: The objective of this course is to help the students to get knowledge about AI & Machine Learning techniques.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	Introduction to Artificial Intelligence (AI) and Problem Space:Introduction AI technique, Turing test, History and developments in AI, applications of AI, State space representation, production systems, systematic control strategies : Breadth first search and Depth first search, problem characteristics, product system characteristics, issues in the design of search programs.	13
II	Heuristic Search Technologies: Introduction to heuristic search, Generate and test, Hill Climbing, Best First search, A*, Problem reduction, AO*. Artificial Neural Networks: Concept, Terminology, Topologies, Advantages.	10
III	Machine Learning: Concept, Cross Validation, Dimensionality Reduction & its Algorithms. Principle Component Analysis. Clustering: Concept, Importance and Methods. Classification: Concept, Terminologies and Algorithms. K-Nearest Neighbors: Computational geometry; Voronoi Diagrams; Delaunay Triangulations,	8
IV	K-Nearest Neighbor algorithm; Wilson editing and triangulations. Aspects to consider while designing K-Nearest Neighbor. Support Vector Machines: Linear learning machines and Kernel space, Making Kernels and working in feature space. SVM for classification and regression problems.	9

Suggested Books:

SI. No.	Name of Books / Authors	Year of Publication
1.	Rich Elaine and Knight Kevin Shiva Shankar B Nair: Artificial Intelligence, Third Edition, Tata-McGraw Hill	

| 2 | Rajasekharan, S. and Vijayalakshmi Pai, G. A.: Neural Networks, Fuzzy Logic and Genetic Algorithms, Prentice Hall of India. | |

Course Outcomes:
- Remember the Concept of Artificial Intelligence and Machine Learning.
- Understand different artificial intelligence and machine learning algorithms.
- Apply machine learning models like K-nearest neighbor and support vector machine.
- Examine machine learning algorithms to solve problems.
- Investigate regression and classification problems using SVM.

SUBJECT TITLE: SYSTEM ANALYSIS AND DESIGN
SUBJECT CODE: MCA1105
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of course: To teach the analysis and practicality of various systems on which software system can be developed.
Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	System Definition and concepts: General Theory systems, Manual and automated systems, Real-life Business Sub-Systems, System Environments and Boundaries. Realtimeand distributed systems, Basic principles of successful systems, Approach to system development: Structured System Analysis and Design, Prototype, Joint Application Development. Role and Need of Systems Analyst, Qualifications and responsibilities, System Analysis as a Profession	10
II	Introduction to Systems Development Life Cycle (SDLC), Various phases of SDLC: Study, Analysis, Design, Development, Implementation, Maintenance, Systems documentation consideration: Principles of Systems Documentation, Types of documentation and their importance, Enforcing documentation discipline in an organization. Data and fact gathering techniques: Interviews, Group Communication-Questionnaires, Presentation & Site Visits, Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits Analysis, Schedule, Legal and contractual, Political. l\1odem Methods for determining system requirements: Joint Application Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal. Module specifications, Top-down and bottom-up design, Module coupling and cohesion, Structure Charts.	10
III	Process modeling, Logical and physical design, Conceptual Data Modeling, Entity Relationship Analysis, Entity Relationship Modeling,	10

	ERDs and DFDs, Concepts of Normalization, Process Descriptions, Structured English, Decision tree, Decision tables, Documentation: Data dictionary, Recording Data Descriptions. Classification of forms, Input/output forms design, User interface design, Graphical interfaces, Standards and guidelines for GUI design, Designing Physical Files and Databases: Designing fields, Designing Physical Records, Designing Physical Files, Designing Databases. Introduction to CASE Tools, Features, Advantages and Limitations of CASE Tools,	
IV	Planning considerations, Conversion methods, procedures and controls, System acceptance criteria, System Evaluation and Performance, Testing and Validation, Preparing User Manual, Maintenance Activities and Issues. Introduction to UML, OO Development Life Cycle and Modeling, Static and dynamic modeling, Comparison of OO and Module-oriented Approach, Modeling using UML. Audit of Computer System Usage, Types of Threats to Computer System and Control Measures: Threat and Risk Analysis, Disaster Recovery and Contingency Planning, Viruses.	10

Suggested Books:

SI. No.	Name of Books / Authors	Year of Publication
1.	System Analysis and Design Awad Elias N. Second Edition, Galgotia Publications	2010
2	Analysis and Design of Information System Sen James A. Second Edition, Tata McGraw Hill.	2012

Course Outcomes:
- Understand the basic concepts of various system and also know the system Analyst roles.
- Analysis system development life cycle and also develop a requirements/specification document.
- Implementation of information gathering tools and also perform feasibility study of system.
- Organize and develop data flow diagrams and decision tables.
- Describe system Testing and Validation and also coverage of UML and threats of systems.

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SUBJECT TITLE: S/W-LAB I (Advance Web Development)
SUBJECT CODE: MCA1106
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam: 3 Hrs

Course Objective:

- To design and develop dynamic web pages.
- To study the concepts of web applications this includes XML and PHP.
- To study formatting and validating web pages.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
1	This laboratory course will mainly comprise of exercises on all the concepts covered in MSC1101. Practical file must be maintained accordingly	40

Course Outcomes:
- Understand, analyze and apply the role of languages like HTML, DHTML, CSS, JavaScript and PHP.
- Analyze a web page and identify its elements and attributes.
- Create web pages using HTML, DHTML and Cascading Style Sheets.
- Create dynamic web pages using JavaScript, XML.
- Build web applications using PHP.

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SUBJECT TITLE: S/W-LAB II (C Language)
SUBJECT CODE: MCA1107
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam: 3 Hrs

Course Objective:

- The purpose of the course is to provide students with an understanding of programming Concepts.
- To learn How to create, implement and debug the program.
- To learn how to Implement Functions, Arrays, Pointers, Structures according to the requirement of the application.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
1	This laboratory course will mainly comprise of exercises on all the concepts covered in MCA 1102. Practical file must be maintained accordingly	40

Course Outcomes:
- Understand to create, save, compile and run a program In C.
- Develop programming skills using the fundamentals and basics of C Language.
- Develop programs using the basic elements like control statements, Arrays and Strings.
- Enable effective usage of arrays, structures, functions and pointers.
- Implement files and command line arguments.

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SECTION 2
Detailed Syllabus with Course Outcomes

SYLLABUS
SEMESTER-2

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SECTION 3
Detailed Syllabus with Course Outcomes

SYLLABUS
SEMESTER-3

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SUBJECT TITLE: Object Oriented Programming Using C++
SUBJECT CODE: MCA1201
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective of course: To give students' the exposure to basic concepts of object-oriented technology. It will help in learning to write programs in C++ using object-oriented paradigm. Approach in this Course is to take C++ as a language that is used as a primary tool in many different areas of programming work.
Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	Object Oriented vs Procedural Languages, Object Oriented Concepts: Data abstraction, encapsulation, Classes and objects, modularity, hierarchy, concurrency, persistence, Polymorphism, Inheritance. Tokens, Expressions, Operators & Control Structures. Scope Resolution operator, member de-referencing operator, Reference Variables	10
II	Defining a class, its member and member functions, Objects, accessing class Members. Access specifiers – public, private, and protected Classes, its members, objects and memory allocation, static data & member function, constant parameters & member functions, friend functions & friend classes, role of constructors & destructors, dynamic objects, operator overloading, function overloading.	10
III	Inheritance in C++: Derivation Rules, Single Inheritance, Multiple Inheritance, Hierarchical Inheritance, Multilevel Inheritance, Roles of constructors and destructors in inheritance. Run-time Polymorphism in C++: Virtual functions and their needs, Pure virtual function, virtual derivation and its need, abstract class.	10
IV	File stream classes, ASCII & Binary files, sequential & random access to a file	10

Suggested Books:

SI.No.	Name of Books / Authors
1.	Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia Publications, 1994
2	C++ Programming Language, Bjarne Wesley Publications, 1994.
3	Object Oriented Software Engineering, S.Halladay and M. Wiebel, BPB Publications, 1995.
4	Object Oriented Programming with C++, E.Balagurusamy, Tata McGraw Hill

Course Outcomes:
- Understand THE basics of c++ and how C++ improves C with object-oriented features.
- Understand and Apply the concepts of Classes &Objects,friend function , constructors &destructors in program design.
- Create functions, Static Members & Functions inside and outside the class with the use of scope resolution operator.
- To implement code reusability using inheritance, runtime polymorphism and compile time polymorphism.
- Develop programs using file I/O.

SUBJECT TITLE: RDBMS

SUBJECT CODE: BCA1202

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Course Objectives:

- To study the basic concepts of relational database management systems, relational data model, entity-relationship model, normalization.

- To understand and use of datadefinition and manipulation language to query, update and manage a database with SQL.

- To learn and understand the various concepts of PL/SQL programs.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
I	An Overview of DBMS and DB Systems Architecture : Introduction to Database Management systems; Data Models; Database System Architecture; Relational Database Management systems; Candidate Key and Primary Key in a Relation; Foreign Keys; Relational Operators; Set Operations on Relations; Attribute domains and their Implementation. The Normalization Process : Introduction; first Normal Form; data Anomalies in INF Relations; Partial Dependencies; Second Normal Form; data Anomalies in 2NF Relations; Transitive Dependencies; Third Normal Form; data Anomalies in 3NF Relations; The Entity Relation Ship Model : The Entity Relationship Model; Entities	20

	and Attributes; Relationships; One-One Relationships; Many-to-one Relationships; Normalizing the Model; Table instance charts	
II	Interactive SQL : SQL commands ; Data Definition Language Commands; Data Manipulation Language Commands; The Data types a cell can hold; insertion of data into the tables; Viewing of data into the tables; Deletion operations; updating the contents of the table; modifying the structure of the table; renaming table; destroying tables; Data Constraints; Type of Data Constraint; Column Level Constraint; Table Level Constraint; Null value Concepts; The UNIQUE Constraint; The PRIMARY constraint; The FOREIGN key constraint; The CHECK Constraint; Viewing the User Constraints

Viewing The Data : Computations on Table Data; Arithmetic Operators; Logical Operators; Comparison Operators; Range Searching; Pattern Searching; ORACLE FUNCTIONS; Number Functions; Group Functions; Scalar Functions; Data Conversion Functions; Manipulating Dates in SQl ; Character Functions; | **20** |
| III | Sub queries and Joins : Joins; Equi Joins; Non Equi Joins; Self Joins; Outer Joins; SubQueries; Correlated Queries; Using Set Operators:- Union , Intersect; Minus ;Views and Indexes : Definition and Advantages Views; Creating and Altering Views; Using Views; Indexed Views; Partitioned views; Definition and Advantages of Indexes; Composite Index and Unique Indexes; Accessing Data With and without Indexes; Creating Indexes and Statistics. | **10** |
| IV | Introduction to PL/SQL : Advantage of PL/SQL; The Generic PL/SQL Block; The Declaration Section; The Begin Section; The End Scction; The Character set; Literals; PL/SQL Data types; Variables; Constants; Logical Comparision; Conditional Control inPL/SQL; Iterative Control; Advanced PL/SQL : Types of Cursors; Implicit Cursor; Explicit Cursor; Explicit Cursor attributes;

Cursor For Loop; Parameterized Cursor; Error Handling in PL/sql;Internal Exceptions; User Defined Exceptions | **10** |

Recommended Books:

1. Ullman, Principles of Database Systems

2. Oracle –Developer –2000 by Ivan Bayross.

3. Database System concepts & Oracle (SQL/PLSQ) –AP Publishers

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Course Outcomes:
- Identify the fundamental elements of relational database, design and explain   basic concepts of relational models.
- Compare and analyze different normalization techniques and apply them in design database which possess no anomalies.
- Formulate SQL queries on data.
- Describe the various concepts of PL/SQL and analyze programs conditional control, iterative Control. Evaluate various programs in cursor for loop , error handling in PL/SQL.

SUBJECT TITLE: ADVANCED DATA STRUCTURES

SUBJECT CODE: MCA1203

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam; 3 Hrs

Course Objective:
- The fundamental design, analysis, and implementation of basic data structures.
- Basic concepts in the specification and analysis of programs.
- Various aspects of algorithm development.

SI. No.	Contents	Contact Hours
1	**Complexity Analysis**: Time and Space complexity of algorithms, asymptotic analysis, average and worst case analysis, asymptotic notation, importance of efficient algorithms, program performance measurement, data structures and algorithms. **Stacks and Queues**: Abstract data types, sequential and linked implementations, representative applications such as towers of Hanoi, parenthesis matching, finding path in a maze	10
2	**Lists:** Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, doubly linked lists, circular lists, skip lists, applications of lists in bin sort, radix sort, sparse tables. **Dictionary**: Abstract data type, array and tree based implementations.	10
3	**Hashing**: Search efficiency in lists and skip lists, hashing as a search structure, hash table, collision resolution, universal hashing, linear open addressing, chains, hash tables in data-compression, LZW algorithm. **Trees:** Abstract data type, sequential and linked implementations, tree traversal methods and algorithms, Binary trees and their properties, threaded binary trees - differentiation, leftist trees, tournament trees, use of winner trees in mergesort as an external sorting algorithm, bin packing.	10

| 4 | **Search Trees**: Binary search trees, search efficiency, insertion and deletion operations, importance of balancing, AVL trees, searching, insertion and deletions in AVL trees, Tries, 2-3 tree, B-tree. **Heaps:** Heaps as priority queues, heap implementation, insertion and deletion operations, binary heaps, binomial and Fibonacci heaps, heapsort, heaps in Huffman coding. **Graphs:** Definition, terminology, directed and undirected graphs, properties, implementation – adjacency matrix and linked adjacency chains, connectivity in graphs, graph traversal – breadth first and depth first, spanning trees. **Basic algorithmic techniques**: Greedy algorithms, divide & conquer, dynamic programming. Search techniques - backtracking, Sorting algorithms with analysis, integer sorting, selection sort. Graph algorithms: DFS and BFS with applications, MST and shortest paths. | 10 |

Suggested Books:

SI. No.	Name of Books / Authors	Year of Publication
1.	S. Sahni, Data Structures, Algorithms, and Applications in C++, Silicon Press, 2/e.	2005
2	T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press, 3/e.	2009
3	A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C and C++, Prentice Hall, 2/e.	1995

Course Outcomes:
- Students will be able to learn basic ability to analyse algorithms and to determine algorithm complexity.
- Able to solve problems involving graphs, trees and heaps.
- Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.
- To learn different algorithm design techniques (divide and conquer, greedy etc)
- Learn about Hashing as Searching Technique and Collision resolution.

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SUBJECT TITLE: SOFTWARE ENGINEERING
SUBJECT CODE: MCA1204
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective:

- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.

- Use tools and techniques for producing application software solutions from informal and semi-formal problem specifications.

- Be able to design and communicate ideas about software system solutions at different levels.

Contents of Syllabus:

SI. No.	Contents	Contact Hours
I	Introduction to Software and Software Engineering, Software characteristics, Software crisis, Software Engineering paradigms. Planning a software project -Software cost estimation, project scheduling, personnel planning, team structure.	10
II	Software configuration management, quality assurance, project monitoring, risk management. Software requirement analysis -structured analysis, object oriented analysis and data modeling, software requirement specification, validation.	10
III	Design and implementation of software -software design fundamentals, design methodology (structured design and object oriented design), design verification, monitoring and control, coding. Software reliability -metric and specification, fault avoidance and tolerance, exception handling, defensive programming.	10
IV	Testing -Testing fundamentals, white box and black box testing, software testing strategies: unit testing, integration testing, Validation testing, System testing, debugging. Software maintenance - maintenance	10

| | characteristics, maintainability, maintenance tasks, maintenance side effects. CASE tools. | |

Suggested Books:

SI. No.	Name of Books / Authors	Year of Publication
1.	Roger. S. Pressman, Software Engineering - A Practitioner's Approach, 7th Edition, McGraw Hill, 2010.	2010
2	Rajib Mall, "Fundamental of Software Engineering ", 3rd edition, PHI, 2009.	2009
3	Naseeb Singh Gill, "Software Engineering: Software reliability, testing and quality, Khanna Book Publishing, 2011.	2011

Course Outcomes:

- Students will be able to choose appropriate process model depending on the user requirements.
- Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
- Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.
- Able to use modern engineering tools necessary for software project management, time management and software reuse.
- Students can apply the knowledge, techniques, and skills in the development of a software product.

SUBJECT TITLE: Computer Organization and Architecture
SUBJECT CODE: MCA1205
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objectives:

- Conceptualize the basics of organizational and architectural issues of a digital computer and classify and compute the performance of machines, Machine Instructions.
- Learn about various data transfer techniques in digital computer and the I/O interfaces.
- Estimate the performance of various classes of Memories, build large memories using small memories for better performance and relate to arithmetic for ALU implementation

of data and control signals.

Contents of Syllabus:

SI. No.	Contents	Contact Hours

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I	Basic Electronics: Combinational circuits- half and full adder/subtractor, parallel adder, Multiplexers, Demultiplexers, Decoders, Encoders. Sequential circuits- concept, flip-flops (RS, JK, JK-Master-Slave, D, T), counters (Asynchronous, Synchronous) Mod-3, Mod-5, Decade Counter. Computer organization: Structure of Computer, Instruction codes, Instruction	13

	formats, Instruction cycle, Addressing modes	
II	Basic computer Organisation and design: Register Transfer language & operations, various Arithmetic, Logic & Shift microoperations instructions, codes, computer registers, instructions, timing & control, instruction cycle, design of a complete basic computer, Machine & Assembly Language, hardwired & Micro-programmed control unit, Design of a control unit.	13
III	CPU Architecture: General register & stack organization, instruction formats and addressing modes, ALU & Control unit architecture. Memory Organization: Memory hierarchy, main, auxiliary, cache memory, virtual memory paging and segmentation.	8
IV	I/O Organization: Peripheral Devices, input-output interface, Modes of data transferprogrammed& interrupt initiated I/O, DMA.	6

Suggested Books:

SI.No.	Name of Books / Authors
1.	Morris Mano: Computer System Architecture, PHI.
2	Hayes J.P.: Computer Architecture &Organisation, McGraw Hill.
3	Stone: Introduction to Computer Architecture: Galgotia
4	Tanenbaum: Structured Computer Organisation, PHI.

Course Outcomes:
- Ability to understand the basic and fundamental structure of a computer.
- Understand the general digital logic design concepts like logic gates, and their use in combinational and sequential logic circuit design. Ability to perform computer arithmetic operations.
- Ability to understand the performance requirements of systems and BUS architecture of the system.
- Understand the computer organization, design with micro operation instructions and memory organization like memory hierarchy and management.
- Ability to understand the concept of I/O organization.

SUBJECT TITLE: S/W LAB-IV S/W LAB-III (C++)

SUBJECT CODE: MCA1206

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam; 3 Hrs

Objective: To give students' the exposure to write programs in C++ using object-oriented paradigm. Approach in this Course is to take C++ as a language that is used as a primary tool in many different areas of programming work.

Details of the Course: This laboratory course will mainly comprise of programs on all the concepts covered in MCA1201.

Course Outcomes:
- Implement programs to understand difference between C and C++.
- Implement object oriented concepts such as classes, objects, encapsulation and data abstraction.
- Create different types of functions, constructors and destructors.
- Demonstrate the use of inheritance and polymorphism.
- Develop programs using file I/O.

SUBJECT TITLE: S/W LAB-IV (MYSQL/SQL)

SUBJECT CODE: MCA1207

SEMESTER: II

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam; 3 Hrs

Course Objective:

- To understand and work with different types of query, update data using SQL.

- To learn and work with aggregate functions, Joins and sub-queries in SQL.

- To learn and constructs the PL/SQL programs with conditional and iterative control statements, stored procedures and functions, cursor, error handling.

Contents of Syllabus:

Sr. No	Contents	Contact Hours
	This laboratory course will comprise as exercises to supplement what is learnt under paper MCA1202 RDBMS using Oracle.	

Course Outcomes:
- Create SQL queries on DDL,DML,DCL statements .
- Apply various aggregate functions on the existing data.
- Implement basics, conditional control, iterative Control, programs in PL/SQL.
- Develop programs like conditional control, iterative Control, cursor , error handling in PL/SQL.

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- Implement various join operations on the existing data.

SUBJECT TITLE: JAVA PROGRAMMING
SUBJECT CODE: MCA 2301
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	**1**	**0**	**4.5**

I
Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objectives:

- The student will able to know the basic concepts of java language.
- Students will be able to create number of small applications in Java.
- Students will be able to understand the need of platform independence in today's environment and write programs for solutions to various real-life problems using the object oriented approach and JAVA language.

SI. No.	Contents	Contact Hours
1	Introduction to Java: Features of JAVA, Data Types, Wrapper Types, Variables, Arrays, Operators-Arithmetic, Bit-Wise, Relational, Boolean, Various Control Statements. Introduction to Classes: Class Fundamentals, Declaring Objects, Methods, Constructor, Garbage Collection, Passing Parameters to Methods, Recursion, Access Control, Static, Final and Finally Method.	13
2	Inheritance, Super, Multilevel Hierarchy, Abstract Methods and Classes, Packages and Interfaces, Importing Packages, Exception Handling. Exception Types, Try, Catch, Finally, Throw and Throws, Creating Exception Subclasses.	13
3	Input/output Streams, Reading and Writing Console Input/output, Reading and Writing Files, Difference between JAVA and C++, Wrapper Classes Applets: Basics, Architecture, Skeleton, Simple Applet Display Methods, Repainting, HTML, APPLET Tag, Passing Parameters to Applets.	14

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4	**Outcome of the subject** *Students will be able to understand the need of platform independence in*	

	todays environment and write programs for solutions to various real-life problems using the object oriented approach and JAVA language.	
5.	**Total**	40

SI. No.	Name of Books / Authors	Year of Publication
1.	Patrick Naughton and Herbert Schildt, The Complete Reference JAVA 2, Tata McGraw Hill	2000
2	JAVA Programming Language, Third Edition by Ken Arnold, James Gosling, David Holmes. Pearson Publications.	
3	E. Balagurusamy, "Programming with JAVA",Tata McGraw Hill.	2019

Course Outcomes:

- Understand and use the syntax and semantics of java programming language and basic concepts of OOP
- Able to understand that how to implement the Object oriented features by writing Java programs.
- Develop reusable programs using the concepts of inheritance, interfaces and packages.
- Apply the concepts of Exception handling to develop efficient and error free codes.
- Ability to understand the different concepts of applets and adding them to a HTML File.

SUBJECT TITLE: OPERATING SYSTEM & CONCEPTS
SUBJECT CODE: MCA2302
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective:

- To learn the fundamentals of Operating Systems and types of Operating System.
- To categorize various memory management techniques.
- To illustrate high-level operating systems concepts such as file systems, disk-scheduling algorithms and various file systems.

SI. No.	Contents	Contact Hours

1	Introduction: Evolution of operating systems, operating system concepts and structure, types of operating systems. CPU Scheduling : Scheduling concepts, CPU scheduling algorithms, Algorithm evaluation.	13

2	Memory Management: Memory management without swapping or paging, swapping, overlapped swapping, paging, Segmentation, Virtual memory concepts, Demand paging, Page replacement algorithms, Thrashing. File Systems : File concepts, Access methods, Allocation methods, Directory systems, File protection	13
3	Disk scheduling : Disk scheduling algorithms, selecting a disk scheduling algorithm, System Dead Locks : The dead lock problem, Dead lock characterization, Dead lock Prevention, Dead lock avoidance, Dead lock detection, Recovery from deadlock	14
4	*Outcome of the subject* *Student will be aware of Process Management, Memory Management, File Management and I/O Management in detail, which will be useful to them for Large Application Development*	
5.	**Total**	40

SI. No.	Name of Books / Authors	Year of Publication
1.	Peterson james Land Silberscharz A., "Operating Systems Concepts",Addison-Wesley.	3rd Edition
2	Galvin, "Operating System".	8th Edition

Course Outcomes:
- Understands the different services provided by Operating System at different level.
- They will learn different memory management techniques like paging, segmentation and demand paging etc.
- Exhibit familiarity with the fundamental concepts of file system in OS.
- Exhibit Disk scheduling algorithms used to implement an OS.
- Use of different process scheduling algorithm and synchronization techniques to avoid deadlock.

SUBJECT TITLE: DATA WAREHOUSE & MINING
SUBJECT CODE: MCA2303
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective:

- To Learn to understand the basics functiaonality of Datawarehouse and mining components.
- Learn the different methodologies used in Datawarehouse and Mining.

- To learn the different analyzing techniques of various data.

SI. No.	Contents	Contact Hours
1	Review of Data Warehouse: Need for data warehouse, Big data, Data Pre-Processing, Three tier architecture; MDDM and its schemas, Introduction to Spatial Data warehouse, Architecture of Spatial Systems, Spatial: Objects, data types, reference systems; Topological Relationships, Conceptual Models for Spatial Data, Implementation Models for Spatial Data, Spatial Levels, Hierarchies and Measures Spatial Fact Relationships.	13
2	Introduction to temporal Data warehouse: General Concepts, Temporality Data Types, Synchronization and Relationships, Temporal Extension of the Multi Dimensional Model, Temporal Support for Levels, Temporal Hierarchies, Fact Relationships, Measures, Conceptual Models for Temporal Data Warehouses : Logical Representation and Temporal Granularity	13
3	Introduction to Data Mining functionalities, Mining different kind of data, Pattern/Context based Data Mining, Bayesian Classification: Bayes theorem, Bayesian belief networks Naive Bayesian classification, Introduction to classification by Back propagation and its algorithm, Other classification methods: k-Nearest Neighbor, case based reasoning, Genetic algorithms, rough set approach, Fuzzy set approach Introduction to prediction: linear and multiple regression, Clustering: types of data in cluster analysis: interval scaled variables, Binary variables, Nominal, ordinal, and Ratio-scaled variables	14
4.	**Total**	40

Course Outcomes:
- Understand the functionality of the various datamining and data warehousing component.
- Appreciate the strengths and limitations of variousdata mining and data warehousing models.
- Explain the analyzing techniques of various data.
- Describe different methodologies used in datamining and data ware housing.
- Compare different approaches of data warehousing and data mining with various technologies.

SUBJECT TITLE: OPEN ELECTIVE (MANAGEMENT INFORMATION SYSTEM)
SUBJECT CODE: MCA 2304
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective: The objective of this course is to introduce the students to the Management Information Systems and its application in organizations. The course would expose the students to the managerial issues relating to information systems and help them identify and evaluate various options in Management Information Systems.

SI.	Contents	Contact Hours

No.		
1	Introduction to systems and Basic systems concepts, Types of systems, The systems Approach, Information systems: Definition and characteristics, types of Information, role of Information in Decision – Making, Sub – systems of information systems: EDP and MIS, management levels, EDP/MIS/DSS	13
2	An overview of Management Information System: Definition and Characteristics, Components of MIS, Frame Work understanding MIS: Robert Anthony's Hierarchy of Management Activity. Information requirements and Levels of Management, Simon's Model of decision – Making, structured Vs unstructured decisions, Formal Vs. Information systems	13
3	Developing Information systems: Analysis and design of information systems: Implementation and evaluation, Pitfalls in MIS development.	14
4	*Outcome of the subject* *At the end of the course, it is expected that students are able to understand the usage of Information Systems in management. The students also would understand the activities that are undertaken in acquiring an Information System in an organization. Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organization.*	
5.	**Total**	40

SI. No.	Name of Books / Authors	Year of Publication
1.	J. Kanter," Management Information Systems", PHL.	3rd Edition
2	Goirden B. Davis &M.H.Olsca " Management Information Systems: Conceptual Foundation, Structure and Development:	
3	Robert G. Murdick& Joel E. Ross & James R. Claggett, "Information Systems for Modern Management", PHI.	3rd Edition
4	Lucas, "Analysis, Design & Implementation of Information system".	

Course Outcomes:

SUBJECT TITLE: MINOR PROJECT

SUBJECT CODE: MCA2305

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

SI. No.	Contents	Contact Hours

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1	This Phase of the project is basically to study an existing manual system about the requirement gathering, finding out the feasibility and to finally come up with a blueprint about how to proceed with the implementation part A spiral bind report must be submitted for the same	40
2	*Outcome of the subject* *After the successful completion of this phase student will be able to analyze the existing system. What are the requirements of the user, what should be the inputs and how to produce the output*	
	Total	40

Course Outcomes:

- Students will be able to practice acquired knowledge within the chosen area of technology for project development.
- Identify, discuss and justify the technically and feasible aspects of the chosen project with a comprehensive and systematic approach.
- Redesign, progress and filter technical aspects for software development projects.
- Work as an individual or in a team in development of technical projects.
- Communicate and report effectively project related activities and findings.

SUBJECT TITLE: S/W LAB – V (Java)

SUBJECT CODE: MCA2306

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam; 3 Hrs

Course Objectives:

- An introduction to popular object oriented programming language i.e java.
- The students should be able to create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism.
- The students can create applications based on Input and Output functionality to read from and write to text files.

SI. No.	Contents	Contact Hours

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1	This laboratory course will mainly comprise of exercises on all the concepts covered in MCA2301.	40

	Practical file must be maintained accordingly	
2	*Outcome of the subject* *Students will be able to implement the various concepts studied under MCA 2301*	
3.	**Total**	40

Course Outcomes:

- Able to develop the basic java programs based on class, objects and methods.
- Able to write programs based on Arrays, Abstraction, static keyword.
- Able to write programs based on Inheritance, Final keyword, Interface.
- Able to develop programs based on exception handling.
- Able to develop the Applets programs and adding them to HTML file.

SUBJECT TITLE: S/W LAB – VI (LINUX)

SUBJECT CODE: MCA2307

SEMESTER: III

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam: 3 Hrs

Course Objective:

- Operate open source operating system like Linux.
- Create scripts in Linux.
- Implement advanced concepts using open source operating system.

SI. No.	Contents	Contact Hours
1	Exercise on Introduction to LINUX operating system and its file system. Exercise on installation of LINUX operating system. Study of General purpose utilities commands. Study of file system navigation commands. Study on shells used in linux.	13
2	Study on User and session commands. Exercise on to change file permissions. Study of VI Editor. Study of Shell Script. Exercise on execution of C and C++ programs in linux.	13
3	Exercise on pipe and filter Commands. Exercise on Linux other commands part – 1.	14

	Exercise on Linux other commands part – 2. Exercise on Linux other commands part – 3. Exercise in expression commands.	
4	*Outcome of the subject* *This laboratory course will mainly comprise of exercises on all the concepts covered in MCA- 2302 .Practical file must be maintained accordingly.*	
5.	**Total**	40

Course Outcomes:

- Build the Linux operating system and configure it.
- Discover Linux commands for working with Linux Environment.
- Appraise the important Linux/UNIX library functions and system calls.
- Appraise Process Management algorithms, Process Management.
- Obtain a foundation for an advanced course in operating systems.

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SECTION 4
Detailed Syllabus with Course Outcomes

SYLLABUS
SEMESTER-4

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SUBJECT TITLE: INTERACTIVE COMPUTER GRAPHICS
SUBJECT CODE: MCA 2401
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Objective: The aim is to introduce the students to key concepts of Computer Graphics like display devices, co-ordinate system, transformations, line and circle drawing, pointing, positioning, projections, etc.

SI. No.	Contents	Contact Hours
1	Display Devices : Line and point plotting systems, Raster, vector, pixel and point plotters, Continual Refresh and storage displays, Digital frame buffer, Plasma panel displays, Display processors, Character generators, Colour display techniques : shadow mask and penetration CRT, Colour look-up tables, hard-copy colour printers.	10
2	Display Description: Screen co-ordinates, user co-ordinates, use of homogeneous coordinates, Display code generation, Graphical functions, the view algorithm, Two-dimensional transformation, Line-drawing, Circle drawing algorithms.	10
3	Interactive Graphics: Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse, track balls), Interactive graphical techniques, Positioning, (Elastic or Rubber Band lines, Linking, zooming, panning, clipping, windowing, scissoring), Mouse Programming. 3-D Graphics: Wire-frame, perspective display, perspective depth, Projective transformations, Hidden line and surface elimination (Black face removal algorithm).	10
4	Turbo-C Graphic Language: Primitives (constants, actions, operators, variables), Plotting and geometric	10
	transformations, Display subroutines, Concept of Animation, Saving, Loading and Printing graphics images from/to disk, Animated algorithms for Sorting, Towers of Hanoi. Open GL: Primitives of the language and interface with C/C++.	
4	*Outcome of the subject* *Students will be able to interpret the 2D and 3D visual information. Also they will gain proficiency in computer graphics API programming*	
5.	**Total**	40

SI. No.	Name of Books / Authors	Year of Publication
1.	Giloi, W.K., 1978: Interactive Computer Graphics, Prentice-Hall.	

2	Newman, W., Sproul, R.F., 1980: Principles of Interactive Computer Graphics, McGraw-Hill.	1980
3	Rogers, D.F., 1985: Procedural Elements for Computer Graphics, McGraw-Hill.	1985
4	Harrington, S., 1983: Computer Graphics: A Programming Approach, Tata McGraw-Hill.	1983
5	Foley, J.D., Van Dam A., 1982: Fundamentals of Interactive Computer Graphics, Addison-Wesley.	1982
6	Hearn, D., Baker, P.M.: Computer Graphics, Prentice-Hall.	2014
7	Tosijasu, L.K., 1983: Computer Graphics, Springer-Verlag.	1983
8	Kelley Bootle: Mastering Turbo C. Galgotia.	
9	Plastock, Roy, 1986: Theory & Problems of Computer Graphics, Schaum Series, Tata McGraw Hill.	1986

Course Outcomes:

- Understand the fundamentals of computer graphics, display devices, graphic primitives such points, lines, circles etc.
- Apply the algorithm for various graphics primitives and to perform 2D transformations.
- Implement interactive graphics like linking, zooming, mouse programming.
- Interpret and demonstrate 3D graphics.
- Create plots, animations and animated algorithms for Sorting, Towers of Hanoi.

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SUBJECT TITLE: SYSTEM SOFTWARE
SUBJECT CODE: MCA 2402
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	**1**	**0**	**4.5**

I
Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective

- To understand the relationship between system software and machine architecture.
- To understand the process of scanning and parsing
- To know the design and implementation of assemblers, macro processor, linker and compiler.

SI. No.	Contents	Contact Hours
1	Introduction to System Software, Translators, loaders, interpreters, compiler, assemblers. Assemblers: Overview of assembly process, design of one pass and two assemblers. Macro Preprocessors: Macro definition and expansion, macro parameters, conditional macro expansion, Nested macro expansion, Design of Macro Preprocessor.	13
2	Compilers: Phases of compilation process, Lexical analysis, Syntax Analysis, parsing, Chomsky Grammars, Code optimization, Intermediate code forms, cross compilers. Interpreters and its types	13
3	Loaders and Linkers: Basic loader functions, various loading schemes, Relocation, program linking, linkage editors, text editors, Linking and its concepts.	14
4	*Outcome of the subject* *Successful completion of the course will make the students clear about the various roles of system software and its basics*	
5.	**Total**	40

SI. No.	Name of Books / Authors	Year of Publication
1.	Leland L. Beck : System Software, An introduction to system programming, AddisonWesley.	3rd Edition
2	D.M. Dhamdhere : Introduction to System Software, Tata McGraw Hill.	3rd Edition
3	D.M. Dhamdhere : System Software and Operating System, Tata McGraw Hill, 1992.	1992
4	Compiler Design ,Ulman and Aho.	

Course Outcomes:

- Understand system software and machine architecture.
- will be learn about assemblers and its design passes.
- Understand and design macro processor and its advanced facilities.
- Learn about compiler phases and code optimization.
- Understand the working principles of linkers and loaders.

SUBJECT TITLE: ADVANCED JAVA
SUBJECT CODE: MCA 2403
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I
Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objectives:

- To learn how to design a graphical user interface (GUI) with AWT and Java Swing.
- To able to create java applications connected with database.
- To create fast and secure multithreading based programs.

SI. No.	Contents	Contact Hours
1	Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files. Swing: Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing. Java Database Connectivity: Connectivity model, Java. SQL package, JDBC Exception	13

	classes, Database connectivity, Data manipulation and navigation, creating database applications.	
2	Java Servlets: Servelets vs CGI, Servlet life cycle, creating and running servlets. Networking: Networking basics, Client/server model, Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Internet Address, URL, Data grams, creating networking applications.	13
3	Java Beans: Component architecture, Components, Advantages of Beans, Bean Developer kit (BDK), JAR files. Java Server Pages: Introduction, JSP Architecture, JSP objects, developing Web Applications.	14
4	*Outcome of the subject* *After the successful completion of the course students can automate enterprises, provide client server solutions which can be stand alone or web based using Advanced Java*	
5.	**Total**	40

SI. No.	Name of Books / Authors	Year of Publication
1.	Cornell, Gary and Horstmann Cay S.: Core Java, Vol I and Vol II, Sun Microsystems Press.	
2	Ivan Bayross: Web Enabled Commercial Application Development using Java 2.0, BPB.	
3	Schildt, Herbert: The Complete Reference Java 2, TMH.	
4	Keogh, James: J2EE: The Complete Reference.	

Course Outcomes:

- Design GUI based applications with AWT, Swings and events handling.
- Articulate the database connectivity using MySQL with Java programming.
- Able to understand and perform Socket based connectivity.
- Understand the concept and usage of Servlet and JSP.
- Develop and understand concepts of distributed Applications.

SUBJECT TITLE: PYTHON
SUBJECT CODE: MCA 2404
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	1	0	4.5

I

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective:

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python

• To develop the ability to write database applications in Python

SI. No.	Contents	Contact Hours
1	**Introduction to Python :** Python's Technical Strengths, Execution Model, Process of Computational Problem Solving, Different ways to run Python Programs. **Data and Expressions** : Literals, Variables and Identifiers, Operators, Expressions, Strings, Statements and Data Types, Boolean Expressions (Conditions), Logical Operators, Selection Control, Nested conditions, Debugging. **Lists &Dictionaries :** List Structures, Lists (Sequences) in Python, lterating Over Lists (Sequences) in Python, Dictionaries and Files, Looping and dictionaries, Advanced text parsing.	11
2	**Control Structures**: Conditional blocks using if, else and elif, While statement, Definite loops using For, Loop Patterns. **Functions, Packages and Modules :** Fundamental Concepts, Program Routines, Flow of Execution, Parameters & Arguments, Recursive Functions, Recursive Problem Solving, lteration vs. Recursion, Understanding Packages, Modules, Top-Down Design, Python Modules Importing own module as well as external modules and packages.	11
3	**Files :** Opening Files, Using Text Files, Reading files, Writing files, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, String Processing, Exception Handling. **Objects and Their Use :** Introduction to Object Oriented Programming, Concept of class, object and instances, Constructor, class attributes and destructors, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support.	10
4	**Using Databases and SQL :** Database Concepts, SQL basic summary, SQL Database connection using python, creating and searching tables, Programming using database connections, Basic Data modelling, Programming with multiple tables.	8
	Total	40

SI. No.	Name of Books / Authors	Year of Publication
1.	Head-First Python, 2nd edition, Paul Barry	2016
2	Python Crash Course, Eric Matthes	2016

Course Outcomes:

• Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
• Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
• Express proficiency in the handling of strings, functions, packages and modules.

- Identify the commonly used operations involving file systems and Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.
- Articulate the database connectivity using MySQL with python.

SUBJECT TITLE: S/W LAB VII

SUBJECT CODE: MCA2405

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam; 3 Hrs

Objective: The objective of this course is to ensure that student have a very clear understanding the difference between the graphics and normal programming with a practical knowledge. Implementation of graphics will be done using the language like C/C++.

SI. No.	Contents	Contact Hours
1	1. Use of basic functions of graphic available in C++ like circle, putpixel, rectangle, arc, ellipse, floodfill, setcolor etc. 2. Use of basic primitive functions to show some animations. 3. Line Drawing Algorithm like Direct method, DDA and Bresenham's line algorithms. 4. Draw a circle using polynomial, trigonometry method and Bresenham's Algorithm. 5. Draw an ellipse using Bresenham's Algorithm. 6. To move a character along circle. To show 2D Clipping and Windowing.	40
2	*Outcome of the subject* *Practical applications of graphics, Program development and basic animations without using graphical softwares*	
3.	**Total**	40

Course Outcomes:

- Implement basic computer graphics commands such as line,circle,filling functions etc.
- Develop circle using direct method.
- Implement line drawing using direct method.
- Apply the scan conversion algorithm for various graphics primitives.
- Implement 2D transformation and clipping techniques.

SUBJECT TITLE: MAJOR PROJECT

SUBJECT CODE: MCA2406

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam; 3 Hrs

Course Objective:

- Applying techniques for producing application software solutions for real world problems.

- Implementing estimation, design, testing and quality maintenance.

- Learning to work within deadlines.

SI. No.	Contents	Contact Hours
1	This phase will continue from the previous semester work in Minor Project now named as Major Project where student have to develop working model of the study done in Minor Project. Student will choose front end and backend as per his/ her convenience. A hard bind report must be submitted for the same.	40
2	*Outcome of the subject* *After the successful completion of student will be able to make software projects.*	
3.	**Total**	40

Course Outcome:

- Successfully complete a major project working in a team with demonstrated ability to partition a project among multiple people.
- Follow a formal development process to successfully complete a major project with demonstrated knowledge of the process used exhibited in the weekly status reports.
- Submit key development documents that meet minimum engineering standards for correctness, completeness, and clarity.
- Implement a major project while meeting established milestone deadlines during the development process.
- Present a final project presentation and demonstration that clearly shows that all project requirements were met and an analysis (cost, trade-offs, etc.) of how well they were met.

SUBJECT TITLE: PROJECT TRAINING

SUBJECT CODE: MCA2407

SEMESTER: IV

CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Internal Assessment: 60
End Term Exam: 40
Duration of Exam; 3 Hrs

Course Objective:

- Ability to work in a team and also have planning and decision making skills.
- Initiative, Confidence and ability to handle new problems
- Habit to keeping proper records and present a formal comprehensive report of their task.

Course Outcomes:

- Understand the basic concepts & broad principles of Industrial projects.
- Understand the value of achieving perfection in project implementation & completion.
- Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach.
- To make them understand fundamentals of costing and budgeting.
- Apply the risk management plan and analyse the role of stakeholders.