Faculty of Engineering & Technology

Syllabus

For

Master of Computer Applications (MCA)

(Program Code: ET0152)

(2023-25)

Approved by the Academic Council vide resolution no ……

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1. INTRODUCTION

The quality of technical education should be improved in such a manner that Technical Post Graduates are able to compete globally in terms of their knowledge and skills and serve for the society and nation. For this purpose Learning Outcome-based Curriculum Framework (LOCF) is developed.

Incorporation of Learning Outcome-based Curriculum Framework (LOCF) in the Post Graduate program like MCA makes it student-centric, interactive and outcome-oriented to achieve well-defined aims, objectives and goals. The learning outcomes are attained by students through development of skills acquired during the program of study by providing them practical exposure. Program learning outcomes will include subject-specific skills and generic skills, including transferable global skills and competencies. It would also focus on knowledge and skills that prepare students for further study, employment and society development. LOCF help ensure comparability of learning levels and academic standards across colleges/universities.

At present, the goal of technical education may be achieved using the following measures:

i. Curriculum reform based on learning outcome-based curriculum framework (LOCF).
ii. Improving learning environment and academic resources.
iii. Elevating the quality of teaching and research.
iv. Involving students in discussions, problem-solving and out of box thinking about various ideas and their applicability, which may lead to empowerment and enhancement of the social welfare.
v. Motivating the learners to understand various concepts of their educational program keeping in view the regional context.
vi. Enabling learners to create research atmosphere in their colleges/ institutes/ universities.
vii. Teach courses based on Choice Based Credit System (CBCS).

2. LEARNING OUTCOME-BASED APPROACH TO CURRICULUM PLANNING

The Master of Computer Applications (MCA) degree is awarded to the students on the basis of knowledge, understanding, skills, values and academic achievements. Hence, the learning outcomes of this program are aimed at facilitating the learners to acquire these attributes, keeping in view of their preferences and aspirations for knowledge.

The course for MCA is designed according to outcome based approach in the light of Post Graduate attributes, description of qualifications, courses and program learning outcomes. It may lead to all round development and delivery of complete curriculum planning. Hence, it provides specific guidelines to the learners to acquire sufficient knowledge during this program.

The program has been planned in such manner that there is scope of flexibility and innovation in

i. Modifications of prescribed syllabi.

ii. Teaching-learning methodology.

iii. Assessment technique of students and knowledge levels.

iv. Learning outcomes of courses.

v. Addition of new elective courses subject to availability of experts in colleges/institutes/universities across the country.

2.1. Nature and Extent of Post Graduate Program

As a part of effort to enhance employability of technical Post Graduates the outcomes based curriculum are very essential in present day perspective. Therefore, higher education degrees must formulate Post Graduate Attributes (PGAs), qualification descriptors, learning outcomes and course learning outcomes which will help in curriculum planning and development in the form of design and delivery of courses. The overall formulation of the degree program must equip learner to have competencies to provide deliverables to the industry.

2.2. Aims of Post Graduate Program (MCA)

The overall aims of MCA program are to:

i. Create deep interest in Practical learning.

ii. Develop broad and balanced knowledge and understanding of definitions, concepts and principles.

iii. Familiarize the students with suitable tools related to designing, modeling etc.

iv. Enhance the ability of learners to apply the knowledge and skills acquired by them during the program to solve specific problems of their courses.

v. Provide learners sufficient knowledge and skills enabling them to undertake higher studies in technical field.

vi. Encourage the students to develop a range of generic skills helpful in employment, internships and social activities.

2.3. Motive behind curriculum planning and development

The committee considered and discussed the following factors for LOCF for the Post Graduates:

i. Framing of syllabi

ii. Learners attributes

iii. Qualification descriptors

iv. Program learning outcomes

v. Course learning outcomes

vi. Necessity of having elective courses

vii. Academic standards

3. PROGRAM EDUCATIONAL OBJECTIVES(PEO'S):

1. To develop the abilities to face the changing trends and career opportunities in computer application. **(Fundamental Knowledge).**

2. Analyze real life problems, design and develop computing systems appropriate to its solutions that are technically sound, economically feasible and socially acceptable. **(Professional Skill & Society).**
3. To inculcate ethical attitude, effective communication skills, teamwork in their profession and adapt to current trends by engaging in lifelong learning needed for a successful professional career. **(Ethics & Lifelong Learning).**

4. POST GRADUATION ATTRIBUTES (PGAs)

The Post Graduate attributes in MCA are the summation of the expected course learning outcomes mentioned in the end of each course. Some of them are stated below.

PGA1: Discipline-specific Knowledge: Capability of demonstrating comprehensive knowledge of MCA program and understanding of core branch so that it forms a foundation for a Post Graduate program of study.

PGA2: Research-related skills:

To develop a sense of inquiry and capability for asking relevant and intelligent questions, problem identification, synthesizing and articulating; ability to recognize and establish cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

PGA3: Critical Thinking & Analytical Reasoning: Ability to employ critical thinking in understanding the concepts relevant to the various branches of technical courses. Analytical reasoning refers to the ability to look at information, be it qualitative or quantitative in nature, and discern patterns within the information.

PGA4: Problem Solving:

Capability to solve problems by using research-based knowledge and research methods including innovative thinking, design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PGA5: Usage of Modern Tools (Information/digital literacy) & Self-directed learning:

To create, select, and apply appropriate techniques, resources, and modern science and IT tools including prediction and modeling to complex science activities with an understanding of the limitations. Self – directed learning is to provide ability to work independently and do in-depth study of various problems and requirements of society.

PGA6: Communication skills:

i. Ability to communicate various concepts of technical education effectively using practical approach and their geometrical visualizations.

ii. Ability to use courses as a precise language of communication in other branches of human knowledge.

iii. Ability to resolve unsolved problems and requirements of industries and societies.

iv. Ability to show the importance of their technical knowledge as precursor to various scientific developments since the beginning of the civilization.

PGA7. Leadership Readiness/Qualities and Employability Options:

Capability for mapping out the tasks in a team or an organization, self-motivating and inspiring team members to engage with the team objectives/vision and using management skills to follow the mapped path to the destination in a smooth and efficient way. This program will also help students to enhance their employability through self employment (Entrepreneur) or by opting jobs in various sectors like industries, Government offices, PSUs, corporate etc.

PGA8. Multicultural Competence:

Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

PGA9: Moral and ethical awareness/reasoning:

Ability to identify unethical behavior such as falsification or misrepresentation of data and adopting objective, unbiased and truthful actions in all aspects of their program.

PGA10: Lifelong learning:

Life-long learning provides the ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.

5. QUALIFICATION DESCRIPTORS (QDs)

The qualification descriptor suggests the generic outcomes and attributes to be obtained while obtaining the degree of MCA. The qualification descriptors indicate the academic standards on the basis of following factors:

i. Level of knowledge

ii. Understanding

iii. Skills

iv. Competencies and attitudes

v. Values.

These parameters are expected to be attained and demonstrated by the learners after becoming Post Graduates in this program. The learning experiences and assessment procedures should be so designed that every Post Graduate may achieve the program learning outcomes with equal opportunity irrespective of the class, gender, community and regions. Each Post Graduate in technical courses should be able to:

i. Demonstrate fundamental systematic knowledge and its applications. It should also enhance the subject specific knowledge and help in creating jobs in various sectors.

ii. Demonstrate educational skills in areas of their program.

iii. Apply knowledge, understanding and skills to identify the difficult/unsolved problems in courses of their program and to collect the required information in possible range of sources and try to analyze and evaluate these problems using appropriate methodologies.

iv. Apply one's disciplinary knowledge and skills in newer domains and uncharted areas.

v. Identify challenging problems and obtain well-defined solutions.

vi. Exhibit subject-specific transferable knowledge relevant to job trends and employment opportunities.

6. PROGRAM LEARNING OUTCOMES (PROGRAM OUTCOMES)

Students with the MCA degree should be able to acquire following Program Learning Outcomes (PLOs):

PLO1. Apply knowledge, skills, and current tools, recent computing technologies of Computer Science innovatively to different applications.

PLO2. Enhance skills to design and conduct experiments, as well as to analyze and interpret data and address the research gaps to produce solutions with the help of tools, technology and products.

PLO3. Enhance critical thinking by acquiring the skills in modern techniques, methodologies and tools to be innovative and creative. Enhance critical thinking by acquiring the skills in modern techniques, methodologies and tools to be innovative and creative. Analytical reasoning refers to the ability to look at information, be it qualitative or quantitative in nature, and discern patterns within the information.

PLO4. Understand the contemporary research, security issues in the different areas of computer science and solve the real world problems.

PLO5. An ability to identify, analyze, design, develop, implement and integrate software and hardware based computer systems.

PLO6. An ability to communicate effectively, express /present ideas in an impressive and professional manner, both in written and verbal forms.

PLO7. An ability to understand leadership and entrepreneurship qualities.

PLO8. An ability to work in multidisciplinary and multicultural environment, become entrepreneur.

PLO9. An ability to understand health, ethical, legal, financial, and professional responsibilities.

PLO10. To recognizes the need for self-motivation and ability to engage in lifelong learning through continuing education, research and professional development.

Mapping of Post Graduate Attributes (PGAs) and Program Learning Outcomes (PLOs):

PLO/PGA	PGA1	PGA2	PGA3	PGA4	PGA5	PGA6	PGA7	PGA8	PGA9	PGA10
PLO1	■									
PLO2		■								
PLO3			■							
PLO4				■						
PLO5					■					
PLO6						■				
PLO7							■			
PLO8								■		
PLO9									■	
PLO10										■

7. PROGRAM SPECIFIC OUTCOMES (PSO's):

PSO1: Engage in sustainable development and to demonstrate engineering skills for effective interpretation and decision to solve real world problems.

PSO2: To make a strong combination of technical and leadership qualities for successful Professional career in industry or in entrepreneurship.

8. TYPES OF COURSES

1. Courses in a program may be of three kinds: Core, Elective and Skill Enhancement.

a) Core Course:-

There may be a Core Course in every semester. This is the course which is to be compulsorily studied by a student as a requirement to complete the program in a said discipline of study.

b) Elective Course:-

Elective course is a course which can be chosen from a pool of papers. It may be

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain

An Elective Course may be 'Discipline Centric/Specific' & Generic Elective

(i) Discipline Centric/Specific Elective (DSE): An Elective course offered under the main discipline/subject of study is referred to as Discipline Centric/Specific.

(ii) Generic/Open Elective (GE): An elective course chosen from an unrelated discipline/subject is called Generic/Open Elective. These electives will be focusing on those courses which add generic proficiency of students.

c) Skill Enhancement Courses (SEC):-

SEC Courses provide value based and/or skill based knowledge and may content both Theory and Lab/Training/Field Work. The main purpose of these courses is to provide students life- skills in hands- on mode so as to increase their employability.

Bridge Courses:

- Computer Fundamentals(MCA BC101)
- Computer Fundamental Lab(MCA BC102)

Core Courses:

- C Programming (MCA 101)
- Computer Organization (MCA 102)
- Web Technology (MCA 103)
- Linux Programming (MCA 104)
- Data Communications and Networking(MCA 105)
- Mathematical Foundations in Computer Science(MCA 106)
- Object Oriented Programming using C++ (MCA 201)
- Operating Systems (MCA 202)
- Data Structure & Algorithms (MCA 203)
- Database Management System (MCA 204)
- Artificial Intelligence (MCA 205)
- E-Commerce (MCA 206)
- Software Engineering (MCA301)
- Design and Analysis of Algorithms (MCA 302)
- J2EE(MCA303)
- Python Programming(MCA 304)
- Cloud Computing(MCA 305)
- Software Project Management (MCA 401)

Elective Course (Discipline Centric)

- Internet of Things(MCA 306.A)
- Information Security System (MCA 306.B)
- Data mining and Ware house(MCA 306.C)
- Big Data Analytics (MCA 402.A)
- Machine Learning(MCA 402.B)
- Soft Computing(MCA 402.C)

Skill Enhancement Courses (SEC)

- Industrial Training / Seminar (MCA 309)
- Project (MCA 403)

Computation of Workload:

Lecture (L) : 1 Credit = 1 Theory period of one hour duration

Tutorial (T) : 1 Credit = 1 Tutorial period of one hour duration

Practical (P) : 1 Credit = 1 Practical period of two hour duration

9. PROGRAM STRUCTURE MCA

MCA Year 1 Semester I-BRIDGE COURSE								
THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA BC001	Computer Fundamentals	4	-	-	30	70	100	4
MCA BC002	Computer Fundamental Lab	-	-	2	60	40	100	1

FIRST SEMESTER								
THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 101	C Programming	4	-	-	30	70	100	4
MCA 102	Computer Organization	4	-	-	30	70	100	4
MCA 103	Web Technology	3	1	-	30	70	100	4
MCA 104	Linux Programming	4	-	-	30	70	100	4
MCA 105	Data Communications and Networking	4	0	-	30	70	100	4
MCA 106	Mathematical Foundations in Computer Science	4	-	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 107	Programming in C Lab	-	-	2	60	40	100	1
MCA 108	Web Technology Lab	-	-	2	60	40	100	1
MCA 109	Linux Programming Lab	-	-	2	60	40	100	1
TOTAL		23	**1**	**6**	**360**	**540**	**900**	**27**

SECOND SEMESTER								
THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 201	Object Oriented Programming using C++	3	1	-	30	70	100	4
MCA 202	Operating Systems	3	1	-	30	70	100	4
MCA 203	Data Structure & Algorithms	4	0	-	30	70	100	4
MCA 204	Database Management System	4	0	-	30	70	100	4
MCA 205	Artificial Intelligence	3	1	-	30	70	100	4
MCA 206	E-Commerce	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 207	Data Structure & Algorithms Lab	-	-	2	60	40	100	1
MCA 208	Object Oriented Programming using C++ Lab	-	-	2	60	40	100	1
MCA 209	Database Management System Lab	-	-	2	60	40	100	1
TOTAL		**20**	**4**	**6**	**360**	**540**	**900**	**27**

Note: Industrial Training for 30 days after the completion of II semester.

THIRD SEMESTER								
THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 301	Software Engineering	4	0	-	30	70	100	4
MCA 302	Design and Analysis of Algorithms	4	0	-	30	70	100	4
MCA 303	J2EE	4	0	-	30	70	100	4
MCA 304	Python Programming	3	1	-	30	70	100	4
MCA 305	Cloud Computing	4	0	-	30	70	100	4
Elective(Select any one)								
MCA 306.A	Internet of Things	4	0	-	30	70	100	4
MCA 306.B	Information Security System	4	0	-	30	70	100	4
MCA 306.C	Data mining and Ware house	4	0	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 307	J2EE Lab	-	-	2	60	40	100	1
MCA 308	Python Programming Lab	-	-	2	60	40	100	1
MCA 309	Industrial Training / Seminar	-	-	2	60	40	100	1
TOTAL		23	**1**	**6**	**360**	**540**	**900**	**27**

FOURTH SEMESTER								
THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 401	Software Project Management	3	1	-	30	70	100	4
Elective(Select any one)								
MCA 402.A	Big Data Analytics	4	0	-	30	70	100	4
MCA 402.B	Machine Learning	4	0	-	30	70	100	4
MCA 402.C	Soft Computing	4	0	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 403	Industrial Project	-	-	6	180	120	300	6
TOTAL		7	**1**	**6**	**240**	**260**	**500**	**14**

Note: The total number of the credits of the MCA Program is 95/ 100*

*** This is applicable for those who have to done Bridge Course.**

10. COURSE-WISE LEARNING OBJECTIVES, STRUCTURES AND OUTCOMES (CLOSOs)

I Semester

MCA Year 1 Semester I-BRIDGE COURSE								
THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA BC001	Computer Fundamentals	4	-	-	30	70	100	4
MCA BC002	Computer Fundamental Lab	-	-	2	60	40	100	1

MCA BC001: Computer Fundamentals

Course Objective:

- To know the importance of information systems of computer
- To evaluate the role of the major types of memory in computer
- To assess the impact of the Internet and Internet technology and software.
- To learn communication and networking concept.

Course Contents:

Unit I **Computer Basics**: What are computers? The evolution of computers, Generations of Computers, classification of Computers, **Interfacing with the Computer:** What is Data Processing, Data and Information, Block Diagram, Input-output devices, Description of Computer input- Output Units, Hardware's and software's.

Number System: Representation of integers, Representation of Fractions, Octal and Hexadecimal representation of numbers, Decimal to Binary Conversion. Binary addition, subtraction of numbers, Two's Complement representation of numbers, Addition/ subtraction of numbers in 2's Complement rotation, Binary multiplication, Binary division, Floating Point representation of numbers.

Unit II **Computer Memory:** Memory Cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices Used to construct Memories, Magnetic Hard disk, Floppy Disk Drives, Compact Disk Read Only Memory, Magnetic Tape Drives. **Languages:** Programming Language, Assembly language, Low level and high level languages, assemblers, compilers, interpreters, linkers, algorithms, flow charting, decision tables, pseudo code.

Unit III **Software concepts:** System & application software packages. **Operating system:** Why do we need an Operating System? Batch operating system, Multiprogramming Operating system, Time sharing operating system, Personal Computer Operating System, Unix Operating System, On- line and Real time system.

Unit IV **Data and Network Communication:** Types of Communication, Need for computer communication networks, Internet and World Wide Web, Characteristics of Communication Channels. Allocation of Channel, Physical communication media, Computer Network Topologies, Communication Protocols, Local Area Networks, ATM Networks, Interconnecting Networks

Unit V **Introduction to MS-Word, MS-Excel, MS-Power point:** Introduction, Windows 2007 Interface, Customizing the Word Application, Document Views, Basic Formatting in MS Word 2007, Advanced Formatting, Navigating through a Word Document, Performing a Mail Merge, A Quick Look at Macros, Printing Documents, Print Preview ***Excel 2007:*** Introduction, Workbook, Worksheet,

Formatting in excel, Advanced formatting in Excel, Working with formulas, Printing worksheets ***MS PowerPoint:*** Introduction, Creating a Presentation, Basic Formatting in PowerPoint, Advanced Formatting, Using Templates, Inserting charts, Inserting tables, Printing presentations

Textbooks:

1. "Introduction to Information Technology", ITL Education Solutions Ltd., Pearson Education
2. Sinha P. K. & SinhaPriti, "Computer Fundamentals", BPB Publications.

References:

1. Raja Raman V. , "Introduction to Computers", PHI Publications
2. Leon Alex & Leon Mathews, "Introduction to Computers", Vikas Publishing House
3. Norton. Peter, "Introduction to Computers", TMH
4. Saxena Sanjay. , "A First Course in Computers", Vikas Publishing House Pvt. Ltd.
5. Nagpa lD.P.,"Computer Fundamentals", S. Chand Publications
6. Bharihoke Deepak, "Fundamentals of Information Technology", Excel Books

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Define computer hardware and peripheral devices
CO2: Discuss with software applications
CO3: Explain file management
CO4: Experiment on Creating basic documents, worksheets, presentations with their properties.
CO5: Experiments on working with email and recognize email netiquette.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	H	L	M	M	-	-	-	-	-	H	M	L
CO2	L2	L	M	M	H	M	-	-	-	-	L	M	M
CO3	L2	M	L	L	M	M	-	-	-	-	M	H	M
CO4	L3	H	H	H	H	H	-	-	L	-	H	H	L
CO5	L4	M	L	M	M	L	-	-	L	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO3, CO4, CO5

MCA BC102: Computer Fundamental Lab

Course Objective(s):

- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing.
- Provide hands-on use of Microsoft Office 2010 applications Word, Excel, Access and PowerPoint. Completion of the assignments will result in MS Office applications knowledge and skills

LIST OF EXPERIMENTS:

1. Create simple news letter in ms word.
2. Create greeting card in ms word.
3. Create a mail merge letter in MS Word.
4. Create a macro for inserting a picture and formatting the text.
5. Create a simple presentation in MS Power Point to list simple dos commands, hardware, software.
6. In Power Point create an animation with video and sound.
7. In MS Excel create a report containing the pay details of the employee with followings:

   It contains: s.no, name, employee id

   Enter the following formula to calculate the respective values.

   da (60% of basic)

   hra (7.5% of basic)
8. Create a student result sheet:
9. Create a pie chart for a sample data and give legends
10 create a macro which creates a line chart using the data in the worksheet

Course Outcomes:

Upon completion of this course, the student will be able apply technical knowledge and perform specific technical skills, including:

CO1. Understand the Usage of computers and why computers are essential components in business and society.

CO2. Determine the Internet Web resources and evaluate on-line e-business system.

CO3. Solve common business problems using appropriate Information Technology applications and systems.

CO4. Compute and Identify categories of programs, system software and applications. Organize and work with files and folders.

CO5. Describe various types of networks network standards and communication software.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	**Bloom Level**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	L2	M	L	L	M	-	-	-	-	-	M	L	H
CO2	L2	H	M	M	H	M	-	-	-	-	H	M	M
CO3	L4	M	L	L	M	-	-	-	-	-	M	L	M
CO4	L3	L	L	L	M	-	-	-	-	-	L	H	H
CO5	L1	M	L	L	L	L	-	-	-	-	M	L	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----------
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	

FIRST SEMESTER

THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 101	C Programming	4	-	-	30	70	100	4
MCA 102	Computer Organization	4	-	-	30	70	100	4
MCA 103	Web Technology	3	1	-	30	70	100	4
MCA 104	Linux Programming	4	-	-	30	70	100	4
MCA 105	Data Communications and Networking	4	0	-	30	70	100	4
MCA 106	Mathematical Foundations in Computer Science	4	-	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 107	Programming in C Lab	-	-	2	60	40	100	1
MCA 108	Web Technology Lab	-	-	2	60	40	100	1
MCA 109	Linux Programming Lab	-	-	2	60	40	100	1
TOTAL		24	**1**	**7**	**320**	**360**	**540**	**900**

MCA 101: C Programming

Course Objective:

- To Gain a thorough understanding of the fundamentals of C programming
- To Implement the Ideas of algorithm and computational procedure, editing and executing 'C'- programs in Linux and Windows.
- To Speculating algorithmic solutions to problems and implementing algorithms in C
- To Enlightening Library functions, branching and decision making statements.
- To understand modular programming and recursive solution formulation.

Course Contents:

Unit I **Introduction:** GCC, Using MAKE Utility, GDB, C Basics: History of C, Characteristics of C, C Program Structure, Variables, Defining Global Variables, Printing Out and Inputting Variables, Constants, Arithmetic Operations, Comparison Operators, Logical Operators, Order of Precedence, Conditionals (The if statement , The ? operator, The switch statement) Looping and Iteration (The for statement, The while statement, The do-while statement, break and continue) Arrays and Strings (Single and Multi-dimensional Arrays, Strings) Functions (Function Prototyping, passing parameters, returning values, recursion) Storage classes (auto, extern, static, register)

Unit II **Further Data Types:** Defining New Data Types, Structures, Unions, Type-Casting, Enumerated Types, Low Level Operators and Bit Fields (Bitwise Operators, Bit Fields)

Pointers: Pointers arithmetic and Arrays, const pointers, void pointers, near, far and huge pointers Dynamic Memory Allocation and Dynamic Structures: (malloc, calloc and realloc; size of, free, introduction to Linked Lists and dynamic 2-dimensional arrays),Advanced Pointer Topics: (Pointers to Pointers, Pointer to array, Array of pointers, Command line input, Pointers to a Function, Implementing Callbacks)

Unit III **The C Preprocessor:** #define, #undef, #include, #if -- Conditional inclusion, Other Preprocessor Commands) C, Linux and Standard Libraries: (Advantages of using Linux with C, Using Linux System Calls and Library Functions) Integer Functions, Random Number, String Conversion, Searching and Sorting: <stdlib.h>Mathematics: <math.h> (Math Functions, Math Constants).

Unit IV **Input and Output (I/O):** stdio.h Reporting Errors (perror(), errno, exit()) Streams (Predefined Streams, Redirection) Basic I/O (Formatted I/O, printf, scanf), String Handling: <string.h> (Basic String Handling Functions and safety issues, String Searching), Character conversions and testing: ctype.h, Files Character and Line Based I/O, Formatted I/O, Block I/O, File Positioning, Status Functions, Deletion and Renaming, Temporary Files

Unit V File Accessibility and Directories(access, stat, chmod, chown …, chdir, chroot…), Process Control: (Running Linux Commands from C, fork(), the exec family, wait(), exit()), Thread creation-a simple implementation.

Text Books:

1. Yashwant Kanetkar, "Let us C", BPB Publications, 2002.
2. Programming in ANSI C by M.Balaguruswami, Tata McGraw Hill, 2008
3. B. Kernighan and D. Ritchie, "The ANSI C Programming Language", PHI., 2000

References:

1. Yashwant Kanetkar, "Pointers in C", BPB Publications, 2002.
2. Paul Deitel and Harvey Dietel, "How to Program", PHI, 6th Ed., 2010.
3. Rama N. Reddy and Carol A. Ziegler, "C Programming for Scientist and Engineers with Applications", Jones and Bartlet, 2010.

Course Outcomes:

At the end of the course, a student will be able to

CO:1. Describe the concepts of problem solving through C Programming.

CO:2. Apply the programming concepts in C language

CO:3. Understand the diversified solutions using C language.

CO:4. Understand the concept of Input- Output and string handling in C.

CO:5. Experiment File Directories and Process-thread Control

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	**Bloom Level**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	**L1**	H	M	H	M	L	H	H	M	-	H	H	M
CO2	**L3**	M	H	H	M	M	H	H	M	-	H	M	M
CO3	**L2**	M	M	M	L	L	M	H	M	M	M	M	L
CO4	**L2**	H	H	M	M	H	M	H	M	H	H	H	M
CO5	**L3**	H	H	M	M	H	M	H	M	H	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3,CO5
CD5	Industrial visit	

MCA 102: Computer Organization

Course Objective:

- To understand the structure, function and characteristics of computer systems.
- To understand the design of the various functional units and components of computers.
- To identify the elements of modern instructions sets and their impact on processor design.

Course Contents:

Unit I: Introduction and Overview

Register Transfer and Micro operation: Register transfer language, register transfer, bus and memory transfer, arithmetic micro operations, logic micro operations, shift micro operations,

Unit II: Basic Computer Organization and Design

Instruction codes, computer registers, computer instructions, timing & control, instruction cycle, Register-Memory reference instructions, design of basic computer, design of accumulator logic.

Unit III: Central Processing Unit:

Introduction to CPU, general registers organization, stack organization, instruction formats, and addressing modes,

Pipeline: Parallel Processing, instruction pipeline

Unit IV: Micro programmed Control Unit:

Control memory, address sequencing.

Input-Output Organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of data transfer, priority interrupt, direct memory access, input-output processor.

Unit V: Memory organization

Memory hierarchy, main memory, RAM & ROM chips, auxiliary memory, associative memory, cache memory, virtual memory.

Text Books:

1. Mano M, “Computer System and Architecture”, Pearson, 3rd Ed., 2009
2. Stallings W, “Computer Organization & Architecture”, PHI, 8th Ed., 2010.

References:

1. Malvino, “Digital Computer Electronics: An Introduction to Microcomputers”, McGraw Hill, 1993.
2. Andrew S. Tanenbaum, “Structured Computer Organization”, PHI, 5th Ed., 2006.
3. P. V. S Rao, “Computer System Architecture”, PHI, 5th Ed., 2009.

Course Outcomes:

At the end of the course, a student will be able to

CO1: Describe the functional architecture of computing systems.

CO2: Understand Computer Organization and Design

CO3: Explain CPU design and pipelined control units

CO4: Show working of Input-Output Organization.

CO5: Differentiate between different types of Memories.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	**L1**	H	L	H	L	M	H	H	H	-	H	M	L
CO2	**L2**	H	M	H	M	H	H	M	H	L	H	L	L
CO3	**L2**	H	L	H	L	L	H	H	M	L	H	M	M
CO4	**L3**	H	M	M	L	M	H	M	M	-	H	M	L
CO5	**L4**	H	M	M	L	M	H	M	M	-	H	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	

MCA 103: WEB TECHNOLOGY

Course Objectives:

- To design and develop a dynamic website.
- To provide some basic knowledge of web services which are useful for the same.

Course Contents:

Unit I Introduction to Web

What is www, Protocols and programs, application and development tools like Dream Weaver ,Gif Animator , the web browser, What is server, Search Engines choices, setting up web servers, Logging users, dynamic IPWeb Design: Web site design principles, planning the site and navigation,

Unit II Introduction to HTML

What HTML is-and What It isn't, History of HTML, Structuring HTML page, The HTML><HEAD><TITLE><BODY>tags, Paragraphs, Font tags, Creating different types of Links, Introduction to lists, Different types of lists., Table pats, Sizing tables, borders, cells, Table and cell color and alignment, Aligning your table content, spanning multiple rows and columns, grouping and aligning rows and columns.

Unit III Scripting

What is the scripting, server side and client side scripting, Javascript : Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition

Unit IV DHTML

What is DHTML, The concept of style sheets, Approaches to style sheets, commonly used style sheet properties and values, Controlling page layout CSS properties, Backgrounds, colors and images, setting border appearance Inline style sheets

Unit V Web Forms

Understanding forms and functions, Essential elements of forms, Displaying control labels, Grouping control with field set and legend, What are frames , Working with linked windows, Working with frames, Changing frame borders

Text Books:

1. K. K. Sharma, "Web Technology", A.B. Publication Delhi, First Edition, 2008.
2. Jonathan Gennick with Tom Luers, 'Teach yourself HTML', 2nd Edition ,SAMS
3. Ethan Cerami, "Web Services", O'Reilly Media, 2002.
4. Achyut S Godbole and AtulKahate, "Web Technologies", Tata McGraw Hill.

References Books:

1. Raj Kamal , "Internet and Web Technologies", TMH.
2. Deitel, "Internet & World Wide Web , How to Program", PHI.
3. HTML: A Beginner's GuidebyWendy Willard (Author)
4. Rick Dranell, "HTML4 unleashed", Techmedia Publication, 2000.
5. T. M. Ramachandran , "Internet & Web development", Dhruv.
6. Ivan Bay Ross, "HTML, DHTML, Java script, Perl CGI", BPB.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand the basics of internet and Working with HTML and scripting.

CO2: Create web pages using HTML

CO3: Build dynamic web pages using JavaScript

CO4: Work with DHTML

CO5: Work with Forms.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	**Bloom Level**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	L2	H	-	M	-	M	-	M	-	-	H	L	L
CO2	L3	M	-	L	-	M	-	H	-	-	H	L	L
CO3	L2	L	-	L	-	M	-	H	-	-	M	M	M
CO4	L1	M	-	M	-	H	-	M	-	-	M	L	L
CO5	L2	M	-	M	-	M	L	L	L	-	H	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4, ,CO5
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO3, CO4,CO5

MCA 104: Linux Programming

Course Objective

- A comprehensive overview of the Linux operating system along with Shell commands and shell scripting
- To Implementation of Linux System program through GCC compiler.
- To Understand the basic concept of Socket programming (TCP and UDP)

Course Contents:

Unit I **Linux – The Operating System:** Linux history, Linux features, Linux distributions, Linux's relationship to UNIX, Overview of Linux architecture, Installation, Start up scripts, system processes (an overview, File system, files permissions). User Management: Types of users, The powers of Root, managing users (adding and deleting), internal & external commands, General purpose utilities command.

Unit II **Shell Programming:** Available shells under Linux (viz. Bash, TCSH, Korn or so on), different Shell features, vi editors, shell commands, shell scripts: shell variables, environmental variables, purpose of shell scripts, writing, storing and executing scripts, Filters- The grep family, advanced filters-sed and awk.

Unit III **Resource Management in Linux:** file and directory management calls for files Process Management, File ownership, and file permission File types, The Linux File System: Basic Princples, Different File Types, File Permissions, Directory Structure, System calls, file descriptors, low level file access – File structure related system calls (File APIs),

Unit IV Process– Process concept, Kernel support for process, process attributes, process control process creation, waiting for a process, process termination, zombie process, orphan process, Signals, IPC: Pipes, FIFOs, System V IPC, Message Queues, system calls for processes, Memory Management, library and system calls for memory.

Unit V **Networking in LINUX:** Socket Introduction, Elementary TCP Sockets (Socket Function, Connect Function, Bind, Listen, Accept, Fork and Exec), TCP Client server Example, Elementary UDP Sockets.),Linux Security

Text Books:

1. Arnold Robbins, "Linux Programming by Examples The Fundamentals", Pearson Education, 2nd Ed., 2008.
2. Cox K, "Red Hat Linux Administrator's Guide", PHI, 2009.
3. R. Stevens, "UNIX Network Programming", PHI, 3rd Ed., 2008.
4. Sumitabha Das, "Unix Concepts and Applications", TMH, 4th Ed., 2009.

Reference Books:

1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", O'Reilly Media, 6th Ed., 2009.
2. Neil Matthew, Richard Stones, Alan Cox, "Beginning Linux Programming", 3rd Ed., 2004.
3. Robert Love, "Linux System Programming", O'Reilly Media, 2nd Ed., 2007.
4. Yashwant Kanetkar , "Unix Shell Programming", BPB, 7th Ed., 2007.

Course Outcome

At the end of the course, the student will be able to:

CO1: Describe the LINUX operating system.

CO2: Experiment with shell scripts in order to perform basic shell programming.

CO3: Explain LINUX file system.

CO4: Describe the process and sytem calls.

CO5: DiscussNetworking in LINUX.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L2	H	-	M	-	L	M	M	-	L	M	L	L
CO2	L3	H	-	M	-	M	-	M	-	-	M	L	L
CO3	L2	M	-	M	-	M	M	L	-	-	L	L	L
CO4	L1	M	-	M	-	L	-	H	-	-	L	L	L
CO4	L2	M	-	M	-	L	-	H	-	-	L	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	CO5

MCA 105: Data Communications and Networking

Course Objectives:

- To covers the theory and practice of data communication between computing devices.
- To introduce the network architecture and topology, Basics of networking and protocols, OSI network layered models and Application layer protocols.

Course Contents:

Unit I **Introductory Concepts:** Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology. Transmission methods Synchronous & Asynchronous, Flow Control, Error Control, Error Detection methods.

Physical Layer: The Physical Layer, Theoretical Basis for Data Communication, Guided Transmission Media, Wireless Transmission, Communication Satellites Digital Signal Encoding Formats – NRZ-L, NRZI, bipolar-AMI, Manchester, Differential Manchester, Digital Modulation – ASK, FSK, PSK, PSK, Digitization – Sampling Theorem, PCM, DM, Analog Modulation – Introducing AM, FM, PM, The Mobile Telephone System.

Unit II **The Data Link Layer:** Data Link Layer Design Issues, Error Detection and Correlation, Flow Control Protocols, Stop-and-wait Flow Control, Sliding – Window Flow Control, Error Control, Stop-and-wait ARQ, Go-back-N, Selective-repeat, Example of Data Link Protocols- HDLC

Medium access sub layer: Channel allocations, ALOHA Protocols, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free protocols, Ethernet, wireless LANs, Blue Tooth, Data Link Layer Switching

Unit III **Network Layer:** Point-to-Point network, routing algorithms, congestion control, internetworking, Quality Control, Internetworking, The Network Layer in the Internet, IP packet, IP addresses, IPv6

Unit IV **Transport Layer:** Design Issue, connection management, TCP window management, User Datagram Protocol, Transmission Control Protocol, and Performance Issues.

Unit V **Application Layer:** DNS, Electronic Mail, WWW, MUTIMEDIA. Network Security: Cryptography and Compression Techniques.

Text Books:

1. Forouzan, “Data Communication and Networking”, TMH, 4th Edition.
2. A.S. Tanenbaum, “Computer Networks”, PHI, 4th Edition.
3. W. Stallings, “Data and Computer Communication”, Macmillan Press.
4. Comer, “Computer Networks and Internet”, PHI.
5. Comer, “Internetworking with TCP/IP”, PHI.

References:

1. W. Stallings, “Data and Computer Communication”, McMillan.
2. J. Martin, “Computer Network and Distributed Data Processing”, PHI.
3. W. Stallings, “Local Networks”, McMillan.

Course Outcomes:

At the end of the course, a student will be able to

CO1. Understand the functions of the different layer of the OSI Protocol Classify their roles.

CO2. Apply the function as of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.

CO3. Understand the Data Link Layer

CO4. Understand a given problem related TCP/IP protocol developed the network programming.

CO5. Implement Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW,HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L4	H	-	H	-	H	M	H	-	-	H	M	M
CO2	L3	H	-	M	-	M	L	H	-	-	H	M	M
CO3	L2	H	-	M	-	M	L	H	-	-	H	H	M
CO4	L2	H	-	H	-	H	M	M	-	L	H	M	M
CO5	L3	H	-	H	-	H	M	M	L	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4,CO5
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO3, CO4, CO5

MCA-106: Mathematical Foundations in ComputerScience

Course Objectives:

- To develop logical thinking and its application to computer science, especially to emphasize the importance of proving statements correctly
- To build theoretical concepts behind various higher level concepts such as graphs
- To understand the basics of matrices and functions
- To understand the Probability theory and statistics
- To know the techniques of data representations

Course Contents:

Unit I Matrices:

Introduction, Rank of Matrix Solving System of Equations, Inverse of a Matrix, Set theory, Principle of inclusion and exclusion, partitions, Permutation and Combination. Relations, Properties of relations, Matrices of relations, Closure operation on relations. Functions-injective. Subjective and objective functions.

Unit II Probability:

Probability Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule. Total probability, Bayes Theorem and independence problems. Introduction to Statistics-Population, Sample, Variable, Descriptive Statics-Mean, Mode, Median, Measures of Spread Range, Inter Quartile Range, Variance, Standard Deviation.

Unit III Propositions & Propositional Calculus:

Propositions and logical operators, Truth table, Propositions generated by a set, Equivalence and implication, Basic laws. Functionally complete set of connectives, Normal forms, Proofs in Propositional calculus, Predicate calculus.

Unit IV Data Representation:

Data Representation – Floating point Arithmetic-Addition, Subtraction, Multiplication and Division operation. Pitfall of floating point representation, Errors in numerical computation Iterative Methods, Measurement of Accuracy by using Absolute Error and Relative Error.

Unit V Graphs& Trees:

Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graph, Multi graphs, Planar Graphs, Euler's Formula, Spanning Trees.

Textbooks/References:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000.
2. R. C. Penner, Discrete Mathematics: Proof Techniques and Mathematical Structures, World Scientific, 1999.
3. S.B. Singh, Discrete Structures, Khanna Book Publishing Company, 2019.
4. Chartrand, Lesniak, and Zhang. *Graphs and Digraphs*, Fifth Edition. CRC Press. 2010.
5. D. Jungnickel. Graphs, *Networks and Algorithms*, Fourth Edition. Springer. 2013
6. Douglas B. West. *Introduction to Graph Theory*, Second Edition. Prentice Hall. 2001.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Solve the simultaneous equations using matrix theory and will be able to solve permutation and combination problems.

CO2: Deal with problems of probability theory.

CO3: Construct simple mathematical proofs and to verify them. Have substantial experience to comprehend formal logical arguments. skillful in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.

CO4: Understand and apply the concept of data representation.

CO5: Understand and apply the concept of Graph thery.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars / Presentations
CD4	Project Discussions
CD5	Self- learning advice using internets

Mapping between Objectives and Outcomes

Course Outcomes	Bloom's Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L3	H	M	H	M	L	M	-	-	M	-	M	H	H	M
CO2	L2	H	M	M	M	L	M	-	-	M	-	M	H	H	M
CO3	L4	H	M	M	M	L	M	-	-	M	-	M	H	H	M
CO4	L2	H	M	M	M	L	M	-	-	M	-	M	H	H	M
CO5	L4	H	M	M	M	L	M	-	-	M	-	M	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4, CO5
CD3	Seminars / Presentations	-
CD4	Project Discussions	-
CD5	Self- learning advice using internets	CO1,CO4,CO5

MCA-107: Programming in C LAB

Course Objective:

- To understand a functional hierarchical code organization.
- To work with textual information, characters and strings.
- To work with arrays of complex objects.
- To understand a concept of functional hierarchical code organization.
- To understand a defensive programming concept.

List of Experiments:

1 Write a program to calculate the area & perimeter of rectangle.

2 Write a program to calculate the area and circumference of a circle for a given radius.

3 Write a program to calculate simple interest for a given principal/amount.

4 Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

5 Write a program to find profit and loss (in percentage) of a given cost price and selling price.

6 Write a program to find out the maximum among the three given numbers.

7 Write C programs that use both recursive and non-recursive functions
To find the factorial of a given integer.

8 Write a program to print the list of first 100 odd number.

9 Write a program to calculate the sum of the digits of a number and display it in reverse order.

10 Write a program to generate a Fibonacci series.

11 Write a program to generate the following series:

```
*
* *
* * *
 * * * * *
* * * * * *
```

12 Write a program to generate the following series:

```
0 1
0 1 0
0 1 0 1
0 1 0 1 0
```

13 Write a program using a function to check whether the given number is prime or not.

14 Write a program to check whether the given string is a palindrome or not.

15 Write a C program that uses functions to perform the following operations:
To insert a sub-string in to given main string from a given position.

16 Write a C program to determine if the given string is a palindrome or not.

17 Write a program to swap two variables a & b using pointers.

18 Write a program to enter a line of text from keyboard and store it in the file. User should enter file name.

19 Write a recursive program for tower of Hanoi problem

20 Write a C program that uses functions to perform the following:

- Addition of Matrices.
- Multiplication of Matrices.

21. Write a program to copy one file to other, use command line arguments.

22. Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)

23. Write a program to perform the following operators an Strings without using String functions

- To find the Length of String.
- To concatenate two string.
- To find Reverse of a string.
- To Copy one sting to another string.

24. Write a Program to store records of an student in student file. The data must be stored using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in Binary File.Append a record in the Student file.

25. Write a programmed to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of File.

Course Outcomes:

At the end of the course, a student will be able to

CO:1. Analyze a problem and develop an algorithm to solve it

CO:2. Show the use of the C programming language to implement various algorithms, and producing the basic concepts and terminology of programming in general

CO:3. Solve the problems using features of the C language.

CO:4. Implement the program, compile, debug, recompile and run it.

CO:5. Evaluate and Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L4	H	-	L	-	L	H	H	-	L	H	H	H
CO2	L3	M	-	L	-	H	M	H	-	-	H	H	M
CO3	L4,L3	H	-	L	-	M	M	M	-	-	M	M	L
CO4	L3	H	-	L	-	H	H	H	-	M	M	M	M
CO4	L5	H	-	L	-	H	H	H	-	M	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CD5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CD5
CD3	Seminars	
CD4	Self- learning advice using internets	CO2, CO3, CO4,CD5
CD5	Industrial visit	

MCA 108: Web Technology Lab

Course Objective:

- To design web development Software and to understand web technologies.
- To make student able for designing and developing the web applications.

LIST OF EXPERIMENTS

1. Write a program to display different style of heading text?
2. Develop and demonstrate a HTML document that illustrates the use external style sheet, ordered list, table, borders, padding, color, and the tag
3. Write an html code for creates the ordered list.
4. Web page creation with all types of cascading style sheets.
5. Create a html registration form and to validate the form using JavaScript code.
6. Create a web page that displays college information using various style sheets.
7. To write a JavaScript program to define a user defined function for sorting the values in an array.
8. Create a web page with field username, password, date of birth, email, and gender contact no.
9. Create a webpage to demonstrate the validation.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: List various tags in html and use these, apply Cascaded style sheet to create web page the help of HTML and Java script.

CO2: Explain usage of web servers and use this to develop webpage and store data in database on Web server.

CO3: Understand and Install Web server to run the web application.

CO4: Apply with web forms to develop dynamic web applications using ADO.net.

CO4: Experiment with web technologies.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	H	-	M	-	M	H	H	L	-	H	L	L
CO2	L2	M	-	H	-	M	H	M	-	-	H	M	M
CO3	L2	H	-	H	-	H	M	H	-	L	H	M	M
CO4	L3	H	-	H	-	H	M	H	-	L	H	M	M
CO5	L4	H	-	H	-	H	M	H	-	L	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO1,CO2, CO3,CO4,CO5
CD3	Seminars	
CD4	Self- learning advice using internets	CO1, CO2,CO3
CD5	Industrial visit	CO5

MCA 109 Linux Programming Lab

Course Objective:

- A comprehensive overview of the Linux operating system along with Shell commands and shell scripting
- To Implement the Linux System programmes through GCC compiler.
- To Understand the basic concept of Socket programming (TCP and UDP)

List of Experiments:

1. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
2. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files
3. Write a shell script to find factorial of a given integer.
4. Write an awk script to count the number of lines in a file that do not contain vowels.
5. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
6. Write a shell script to list all of the directory files in a directory.
7. Write a sell script to find largest no among three no.
8. Write a shell script to print given pattern

   *

   **

   ***

   ****
9. Write a shell script to calculate gross salary of an employee while HRA is 30% of basic salary and DA is 70% of basic salary.
10. Write a shell script to check whether a given file exist or not.

Course Outcome

At the end of the course, the student will be able to:

CO1: Implement the Linux System programmes through GCC compiler.

CO2: Understand the concepts of control structure, loops, case and functions in shell programming and apply them to create shell scripts.

CO3: Use shell script to create files and handle text documents and describe the basic file system in Linux and its file attributes.

CO4: Implement the fundamental LINUX system tools and utilities.

CO5: Obtain a foundation for an advanced course in operating systems.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	H	-	M	-	L	M	M	L	L	M	H	M
CO2	L2	H	-	M	-	M	L	M	M	-	M	M	M
CO3	L3	M	-	M	-	M	M	H	M	-	H	M	M
CO4	L3	M	-	M	-	L	L	H	M	-	M	L	L
CO5	L1	M	-	M	-	L	L	H	M	-	M	L	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4
CD2	Tutorials/Assignments	CO1,CO2,CO3, CO4,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	--

SECOND SEMESTER

THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 201	Object Oriented Programming using C++	3	1	-	30	70	100	4
MCA 202	Operating Systems	3	1	-	30	70	100	4
MCA 203	Data Structure & Algorithms	4	0	-	30	70	100	4
MCA 204	Database Management System	4	0	-	30	70	100	4
MCA 205	Artificial Intelligence	3	1	-	30	70	100	4
MCA 206	E-Commerce	3	1	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 207	Data Structure & Algorithms Lab	-	-	2	60	40	100	1
MCA 208	Object Oriented Programming using C++ Lab	-	-	2	60	40	100	1
MCA 209	Database Management System Lab	-	-	2	60	40	100	1
TOTAL		21	**4**	**7**	**360**	**540**	**900**	**29**

MCA 201: Object Oriented Programming using C++

Course Objectives

- To introduce the basic concepts of Object Oriented Languages like class, object, data hiding, encapsulation, and abstraction.
- To understand and implement concepts like message passing, inheritance, polymorphism, exception handling and generic programming.

Course Contents:

Unit I **OOP Paradigm:** Comparison of Programming paradigms, Characteristics of Object-Oriented Programming Languages, Object-based programming languages, Brief History of C++, Structure of a C++ program, Difference between C and C++ - cin, cout, new, delete operators. Oops concepts: Objects, Classes, Encapsulation, Data Abstraction, Inheritance, Polymorphism, Dynamic Binding, Message Passing,

Unit II Abstract data types, Class Component, Object & Class, Constructors Default and Copy Constructor, Assignment operator deep and shallow coping, Access modifiers – private, public and protected. Implementing Class Scope resolution operator, working with Friend Functions, Using Static Class members. Understanding Compile Time Polymorphism function overloading Rules of Operator Overloading (Unary and Binary) as member function/friend function.

Implementation of operator overloading of Arithmetic Operators, Overloading Output/Input, Prefix/ Postfix Increment and decrement Operators, Overloading comparison operators, Assignment, subscript and function call Operator, concepts of namespaces.

Unit III **Inheritance:** Inheritance, Types of Inheritance, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hierarchies, Overriding inheritance methods, Constructors and Destructor in derived classes.

Polymorphism: Polymorphism, Type of Polymorphism – compile time and runtime, Understanding Dynamic polymorphism: Pointer to objects, Virtual Functions pure virtual functions, Abstract Class.

Unit IV **Generic Programming:** Understanding Generic Functions with implementation of searching sorting algorithm. Overloading of Function Templates. Understanding Class Templates using Implementation of Generic stack, linked lists: singly and doubly linked lists, Binary Search Tree basic operations.

Standard Template Library: – Understanding Components of Standard Template Library, Working of Containers, Algorithms, Iteraters and Other STL Elements. Implementation of Sequence and Associative containers for different Algorithms using their Iterator.

Unit V Advanced Input/output Operations, Exception Handling and Manipulating strings, Using istream / ostream member functions, Using Manipulators, Creating Manipulator Functions, Understanding Implementation of Files, Writing and Reading Objects. Understanding of working and implementation of Exception Handling

Text/ Reference Books:

1. R. Venugopal, Rajkumar, and T. Ravishanker "Mastering C++", TMH, 1997.
2. S. B. Lippman and J. Lajoie, "C++ Primer", 3rd Edition, Addison Wesley, 2000.
3. Bruce Eckel, "Thinking in C++", President, Mindview Inc., Prentice Hall, 2nd Ed.
4. D .Parasons, "Object Oriented Programming with C++", BPB Publication.
5. BjarneStroustrup , "The C++ Programming Language", Addison Welsley, 3rd Ed.
6. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication.
7. Schildt Herbert, "C++: The Complete Reference", Tata McGraw Hill, 4th Ed., 1999.
8. Behrouz A. Forouan, Richrad F. Gilberg, Computer Science - A Structural Approach Using C++", Cengage Learning, 2004.
9. Nell Dale, "C++ Plus Data Structure", Jones and Bartlett, 4th Ed., 2010.
10. Nell Dale, Chips Weens, "Programming and Problem Solving with C++", Jones and Bartlett , 5th Ed., 2010.

Course Outcomes:

At the end of the course, the student will be able to:
CO1: Understand the object-oriented programming features in C++.
CO2: Apply C++ features to program design and implementation.
CO3: Solve the problems usisng Inheritance and polymprphysm.
CO4: Implement generic programming language.
CO3: Understand I/O operations and file handling

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	**Bloom Level**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	L2	H	L	H	-	H	L	H	-	-	H	L	L
CO2	L3	H	L	H	-	H	L	H	-	-	H	H	H
CO3	L4	H	L	H	-	H	-	H	-	-	M	L	L
CO4	L3	H	-	M	-	H	-	M	-	-	M	H	H
CO4	L2	H	-	M	-	H	-	M	-	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4
CD4	Self- learning advice using internets	CO1, CO3, CO4
CD5	Industrial visit	CO5

MCA 202: Operating Systems

Course Objectives:

- To become familiar with the fundamental concepts of operating system.
- To become competent in recognizing operating systems features and issues.
- To provide the students with sufficient understanding of operating system design and how it impacts application systems design and performance.

Course Contents:

Unit I Operating System Introduction, Role, Types of OS; Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, Buffering, Spooling, Operating system structure, Operating system components and services, System calls.

Processes: Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Threads.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation

Unit II Interprocess Communication and Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Message Passing.

Memory Management: Background, Logical vs. Physical Address space, swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging.

Virtual Memory: Demand Paging, Page Replacement, Page-replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations, Demand Segmentation.

Unit III **Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock Handling.

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Device Characteristics-Hardware Consideration, Channels and Control Units, Independent Device Operation, Buffering, Multiple Paths, Block Multiplexing, Device Allocation Consideration.

Unit IV Secondary-Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Reliability, Stable storage implementation.

File-System Interface: File Concept, Access Methods, Directory Structure.

File-System Implementation: Introduction, File-System Structure, Basic File System, Allocation Methods, Free-Space Management, Directory Implementation.

Unit V **Security:** The Security problem, Goals of protection, Access matrix, Authentication, Program threats, System threats, Intrusion detection, Cryptography.

Case Study: Linux Operating System and Windows XP.

Text Books:

1. Silbersachatz and Galvin, "Operating System Concepts", John Wiley, 8th Ed., 2009.
2. Milan Kovic., "Operating Systems", Tata McGraw Hill, 2001
3. Deitel, Deitel and Choffnes, "Operating Systems", Pearson ,3rd Edition

Reference Books:

1. Tannenbaum, "Operating Systems", PHI, 4th Ed., 2000.
2. Madnick E. and Donovan J., "Operating Systems", Tata McGraw Hill, 2001.
3. Flynn McHoes, "Operating System", Cengage Learning, 2006.
4. Pbitra Pal Choudhury, "Operating System Principles and Design", PHI, 2009.
5. Sibsankar Halder and Alex A. Aravind, "Operating System", Pearson, 2009.
6. William Stallings, "Operating Systems Internals & Design Principles", Pearson Education, 6th Ed., 2009.

Course Outcomes:

At the end of the course, the student will be able to:

CO:1. Describe familiarity with the fundamental concepts of operating systems and process scheduling.

CO:2. Explain different Memory Management techniques.

CO:3. Understand the Deadlock Handling and Device Management feature of OS.

CO:4. Understand theSecondary-Storage Structure and file management system of OS.

CO:5. Demonstrate the concept of Security in operating system.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	M	-	M	-	M	-	M	-	--	H	H	H
CO2	L2	H	-	L	-	M	-	L	-	-	H	H	H
CO3	L2	M	-	M	-	M	-	M	-	-	H	M	M
CO4	L3	H	-	M	-	M	-	L	-	-	H	H	H
CO5	L3	H	-	M	-	M	-	L	-	-	H	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4
CD4	Self- learning advice using internets	CO1, CO3, CO4
CD5	Industrial visit	-

MCA 203: Data Structure & Algorithms

Course Objective:

- To introduce the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, list, trees and graphs.
- To enable them to write algorithms for solving problems with the help of fundamental data structures

Course Contents:

Unit I **Introduction:** Data Structures, data structure operations, complexity, Asymptotic Notation, Time/Space trade-off. Linear Lists: Arrays, address calculation in single and multidimensional arrays, operations on array, sequential search, Binary Search and their complexity analysis. Stacks: Primitive operations, implementation of stacks using Arrays, applications of stacks arithmetic expression conversion and evaluation.

Unit II **Queues:** Primitive operations; Implementation of queues using Array, applications of linear queue, circular queue and double ended queue (DEQUE). Linked lists and its operations: linked list, representation of link list in memory, traversing a link list, insertion into a link list, deletion from a link list, header link list, two way link lists.

Unit III **Trees:** Definition of tree, Binary tree and related terms, Application of binary tree, Tree Traversals, Threaded tree, Binary Search Tree, heap, heap sort, General trees.

Unit IV **Graph:** introduction, sequentional representation of Graphs, adjacency matrix, path matrix, operations on graphs, traversing a Graph, Warshall's algorithm.

Unit V **Sorting Techniques:** Selection, Insertion, Bubble, Merge, Quick, Radix sort, searching and hashing.

Text Books:

1. Schaum Series, "Introduction to Data Structures", TMH.
2. R.B. Patel, "Expert Data Structures with C", Second Edition, Khanna Book publishing Co (P) Ltd.

Reference Books:

1. Tenenbaum, "Data Structure using C++", PHI.
2. Chattopadhyay S., Dastidar d G.andChattopadhyayMatangini., "Data Structure through C language", BPB publications.

Course Outcomes:

At the end of the course, a student will be able to

CO1: Assess how the choice of data structures and algorithm design methods impacts the performance of programs and apply Search problem in Data Structure.

CO2: Understand basic data structures such as arrays, linkedlists, stacks and queues.

CO3: Implement different types of trees and apply them to problem solutions.

CO4: Implement Graph search and traversal algorithms and determine the time and computation complexity.

CO5: Apply the different sorting techniques to sort the data.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L4	H	-	H	-	H	-	L	M	-	H	H	M
CO2	L2	H	-	H	-	M	-	M	-	-	H	H	H
CO3	L3	H	-	M	-	L	-	M	-	L	H	M	M
CO4	L3	H	-	H	-	M	-	L	-	-	M	H	M
CO5	L3	H	-	H	-	L	-	L	M	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	---------
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO4,CO5

MCA 204: DATABASE MANAGEMENT SYSTEM

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a Database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Contents:

Unit I **Overview and History of DBMS.** File System v/s DBMS.Advantage of DBMS Describing and Storing Data in a DBMS.Queries in DBMS. Architecture and Structure of a DBMS.Data Models, Schemas & Instances.Overview of Data Models ,hierarchical, Network & Relational model.

Unit II **Entity Relationship model**: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.

Unit III **Relational Data Model and Language:** Concepts and Constraints. Relational Algebra - select, project, set theoretic, join operations. Overview of Relational Calculas.SQL - A Relational Database Language. Data Definitioncommands, View and Queries , transaction commands,Specifying Constraints & Indexes in SQL., aggregate function, Null Values, nested sub queries, Joined relations. Triggers.

Unit IV **Schema Refinement**: function dependencies & normalization for relational databases: functional dependencies, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition.

Unit V **Transaction, Concurrency & recovery techniques:**Basic concept; ACID properties; transaction state; Concurrency control techniques, locking techniques, time stamp ordering, granularity of data items, recovery techniques: recovery concepts, database backup and recovery from catastrophic failures. Deadlock and Deadlock handling,

Text Books:

1. Elmsari and Navathe, “Fundamentals of Database Systems”, Pearson Education, 5th Ed., 2006.
2. Korth, Silberschatz, “Fundamentals of Database System Concepts”, TMH, 6th Ed., 2010.
3. Desai, B., “An Introduction to Database Concepts”, Galgotia.
4. Sham Tickoo and Sunil Raina, “Oracle 11g with PL/SQL Approach”, Pearson, 2010.

Reference Books:

1. Date C. J., “An Introduction to Database Systems”, Narosa Publishing, 7th Ed., 2005.
2. S. K. Singh, “Database Systems: Concept, Design, and Applications”, Pearson’s Education, 1st Ed., 2008.
3. Kiffer, “Database Systems: An Application oriented Approach”, Pearson.
4. Ullman J. D., “Principals of database systems”, Galgotia .
5. Shio Kumar Singh, “Databases Systems Concepts, Design and Applications,” Pearson,2006.

Course Outcomes:

At the end of the course, a student will be able to

CO1: Describe DBMS architecture& structure and overview of Data models.

CO2: Apply specification of the requirement design the databases using ER model.

CO3: Understand the Relational database design and apply the SQL Queries for access and manage the data.

CO4: Apply Schema Refinement for reducing the redundancy and remove the functional dependencies.

CO5: Implementation the transaction-processing system determines ACID properties.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	H	-	M	-	H	-	M	-	-	L	H	H
CO2	L3	H	-	M	-	H	-	M	-	-	L	M	M
CO3	L3	H	-	M	-	H	H	H	L	-	L	H	M
CO4	L3	H	-	L	-	H	M	H	L	-	M	H	H
CO5	L3	H	-	M	-	H	M	M	-	-	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4, CO5
CD5	Industrial visit	CO3, CO4, CO5

MCA 205: Artificial Intelligence

Course Objective:

- To introduce the basic principles, techniques, and applications of Artificial Intelligence.
- To Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.

Course Contents:

Unit I Introduction to AI, Various types of production systems, Characteristics of production systems, Study and comparison of breadth first search and depth first search. Techniques, Other Search Techniques like hill Climbing, Best first Search. An algorithm, AO algorithms etc, and various types of control strategies.

Unit II Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic, Resolution, refutation, deduction, theorem proving, inferencing, monotonic and nonmonotonic reasoning.

Unit III Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning.

Unit IV Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and Natural Languages Processing.

Unit V Introduction to learning, Various techniques used in learning, introduction to Neural Networks, applications of Neural Networks, common sense reasoning, some example of Expert systems.

Text/ Reference Books:

1. E.Rich,K Knight-Artificial Intelligence, Tata McGraw Hills.
2. S.Russell,P.Norving-Artificial Intelligence-A Modern Approach, Pearson Education, Asia.
3. Thomas Dean-Artificial Intelligence-Theory & Practice, Pearson Education, Asia.
4. Alison Caursey- The Essence of Artificial Intelligence, Pearson Education, Asia.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO4: Understanding of Game playing techniques and apply various tools and techniques in natural language processing

CO5: Apply various techniques used in learning to solve the real life problems and understanding of nural networks.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	M	-	M	-	M	L	M	L	-	M	H	H
CO2	L3	M	M	H	L	H	L	H	M	-	M	H	H
CO3	L2	H	M	M	M	H	L	M	L	-	M	H	H
CO4	L3	L	M	M	M	M	-	L	M	-	L	H	H
CO5	L3	L	M	M	M	M	-	L	M	-	L	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4 ,CO5
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	CO2, CO4

MCA206: E-Commerce

Course Objective:

- To introduce e-commerce, its impacts on business processes, and keys issues in the development of web-based business information systems and applications.
- To deal with issues of security, electronic payments, mobile commerce and the future aspects of e-commerce.

Course Contents:

Unit I Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.

Unit II E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Unit III Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.

Unit IV E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

Unit V Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, EDI Application in business

Text/ Reference Books:

- David Whiteley, “E-Commerce”, Tata McGraw Hill, 2000 Eframi Turban, Jae Lee
- David King, K. Michale Chung, “Electronic Commerce”, Pearson Education, 2000

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand a good knowledge of e-commerce, both the technical and business aspects.

CO2: Describe different E-Commerce Models.

CO3: Apply the principles and practices of e-commerce and its related technologies like different e-payment technologies.

CO4: Apply a marketing plan and promotional plan for an ecommerce.

CO5: Analyzing the security issues and security approaches.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L2	H	L	H	-	M	M	M	L	M	H	H	H
CO2	L1	H	L	L	-	H	M	M	-	L	M	H	M
CO3	L3	H	-	M	-	M	H	H	-	L	H	H	H
CO4	L3	H	-	M	-	M	L	L	-	L	H	M	M
CO4	L4	H	-	M	-	M	L	L	-	L	H	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	CO3

MCA 207: DATA STRUCTURE&ALGORITHMS LAB

Course Objective:

- To develop skills design and analyze simple linear and nonlinear data structures.
- To identify and apply the suitable data structure for the given real world problem.
- To gain knowledge in practical applications of data structures.

List of Experiments

1. Write a program to insert an element at desire position in the array.
2. Write a program to delete an element at desire position from the array.
3. Write a program to replace an element at desire position in the array.
4. Write a program to search (linear search) an element in the array.
5. Write a program to search (binary search) an element in the array.
6. Write a program to addition and multiply of two matrices.
7. Write a program to implementation of stack using array.
8. Write a program to implementation of queue using array.
9. Write a program to implementation link list.
10. Write a program that sorts the array through Bubble sort.
11. Write a program that sorts the array through Quick sort.
12. Write a program that sorts the array through Merge sort.
13. Write a program that sorts the array through Insertion sort.
14. Write a program to BST (binary search tree) addition, deletion and searching.

Course Outcomes:

At the end of the course, a student will be able to

CO:1. Evaluate and analyze the time and space efficiency of the data structure

CO:2. Evaluate the appropriate data structure for given problem

CO:3. Implementation of data structures using C++.

CO:4. Solve the problems of searching and sorting using techniques.

CO:5. Solve the problems using Tree data structure .

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L5	H	-	M	-	H	-	L	-	-	L	H	H
CO2	L5	H	-	M	-	H	-	L	-	-	H	H	M
CO3	L3	H	-	M	-	H	-	L	-	-	M	H	H
CO4	L4	H	-	M	-	H	-	L	-	-	M	H	H
CO5	L4	H	-	M	-	H	-	L	-	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	--------
CD4	Self- learning advice using internets	CO1,CO2, CO3
CD5	Industrial visit	---------

MCA 208: Object Oriented Programming using C++ LAB

Course Objectives:

- To know different programming paradigms.
- To perform the object oriented programming concepts and methodology using c++.
- To develop the console applications using C++.

LIST OF EXPERIMENTS

1. Write a program to Create Class with Static Member Function.
2. Write a program to define a class to represent a bank account.Include the following members :
    - Data Members
    - Name of the depositor
    - Account number
    - Type of account
    - Balance amount in the account
    - Member Functions
    - To assign initial values
    - To deposit an amount
    - To withdraw an amount after checking the balance
    - To display name and balance

Write a program to test the program.

3. Write a program to using INLINE function.
4. Write a program to using FRIEND function
5. Write a program to using Function Overloading.
6. Write a program to using inheritance (Multiple and Multi Level.) Concept.
7. Write a program which reads a text from the keyboard and displays the following information on the screen in two columns:
    - Number of lines
    - Number of words
    - Number of characters

Strings should be left justified and numbers should be right justified in a suitable field width.

8. Write a program to create files with constructor function.
9. Write a program reading from two files simultaneously.
10. Write program containing a possible exception. Use a try block to throw it and a catch block to handle it properly.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Apply OOPs features to program design and implementation.

CO2: Create Classes according to the problem and implement programs in C++

CO3: Implement Object Oriented Programs using templates and exceptional handling concepts.

CO4: Perform console operations, applications and file handling.

CO5: Implement applications using C++.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	M	-	M	-	M	-	L	L	-	M	H	H
CO2	L6	M	-	M	-	H	-	M	L	-	M	H	M
CO3	L3	H	-	L	-	H	L	L	L	-	M	M	M
CO4	L3	H	-	L	-	H	L	L	L	-	M	M	M
CO5	L3	H	-	L	-	H	L	L	L	-	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1, CO2, CO3,CO4,CO5
CD3	Seminars	
CD4	Self- learning advice using internets	CO1, CO2 CO3
CD5	Industrial visit	-

MCA 209: Database Management System Lab

Course Objectives:

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, and relational models.
- To understand and use SQL to query, update, and manage a database.
- To develop an understanding of essential DBMS concepts such as: transaction processing, integrity, concurrency, and recovery in databases.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

List of Exercises

1. Create the student/employee Table and construct the following requires for the database…
   1..1. Create the table for student/employee.
   1..2. Find out name of all students.
   1..3. Retrieve the list of name and the city of all students.
   1..4. List of all students/employee who stay in city “BOMBAY” or city DELHI”.
   1..5. List of all students /employee who are located in “MADRAS”.
2. (1)Apply these Operations on employee table
   2..1. Insert
   2..2. Select
   2..3. Update
   2..4. Drop
   2..5. Delete
   2..6. Alter
3. Create table with attributes emp. No., emp. Name, Designation, Salary, and Department no. Construct for following queries…..
   .1 Display complete information of all the employees working as a manager.
   .2 Display name of all the employees working as a clerk.
   .3 Suppose DA for manager is 75% of salary then display name of all managers.
   .4 Select names and designation whose salary is greater then 15000.
5. Apply key constraints as Primary Key, Foreign Key etc as per requirement.
4. Between operation- list of all Employee Name & DOJ (date of joining) to join the Company in 2010
5. Join operation- list of all the employees along with their department information by using join operation.

6. AND/OR operation- make a table that have an employee Perform AND/OR operation.
7. Group by function-

   Create the table for facilities having faculty-id, dept. no., designation name and group by similar dept.no. Facilities by using count function.
8. Order by ACS function-

   (a) Create a table for emp. Using following data:- emp. name, emp age, emp salary, emp city & display the emp salary in ascending and descending order.
9. Max-Min function- create a table for student having similar attributes s_name, S_marks, s_id, s_sec & remark.
   i. Find the maximum marks obtained by student.
   ii. Find the minimum marks obtained by student.
   iii. Sum of all students marks using sum function.
   iv. Find the average of marks using avg function.

10. Drop operation- Perform Drop Operation.
11. a) Define DBMS.

b) Key Component- Entity, Attributes

c) SQL

1) DDL

2) DML

d) Relational data model-

1) Relation

2) Tuple

3) Domain

4) Degree

Course Outcomes:

At the end of the course students will be able to

CO1. Designing and creating relational database systems using SQL,

CO2. Demonstrate the use of constraints and relational algebra operations.

CO3. Understand various advanced queries execution such as relational constraints, joins, set operations, aggregate functions, triggers, views and embedded SQL.

CO4: Design and implement database applications on their own.

CO5: Understand of essential DBMS concepts such as: database security, integrity, concurrency,

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	**Bloom Level**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PSO1**	**PSO2**
CO1	L3	M	-	M	-	M	-	M	-	-	M	H	H
CO2	L3	M	-	L	-	H	-	M	-	-	M	H	M
CO3	L2	L	-	L	-	M	-	H	-	-	M	H	H
CO4	L6	M	-	M	-	M	-	H	-	-	M	H	H
CO5	L3	M	-	M	-	M	-	H	-	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2, CO3, CO4,CO5
CD3	Seminars	----------
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	CO4,CO5

THIRD SEMESTER

THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 301	Software Engineering	4	0	-	30	70	100	4
MCA 302	Design and Analysis of Algorithms	4	0	-	30	70	100	4
MCA 303	J2EE	4	0	-	30	70	100	4
MCA 304	Python Programming	3	1	-	30	70	100	4
MCA 305	Cloud Computing	4	0	-	30	70	100	4
	Elective(Select any one)							
MCA 306.A	Internet of Things	4	0	-	30	70	100	4
MCA 306.B	Information Security System	4	0	-	30	70	100	4
MCA 306.C	Data mining and Ware house	4	0	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**No. of Teaching Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 307	J2EE Lab	-	-	2	60	40	100	1
MCA 308	Python Programming Lab	-	-	2	60	40	100	1
MCA 309	Industrial Training / Seminar	-	-	2	60	40	100	1
TOTAL		24	**1**	**7**	**360**	**540**	**900**	**29**

MCA 301: SOFTWARE ENGINEERING

Course Objective:

- To understand the importance, limitations and challenges of processes involved in software development.
- To focuses on the types of various software models, various software design activities, and to learn cost estimation, software testing, Maintenance and debugging.

Course Contents:

Unit I **Software Engineering:** Introduction and Definition of Software Engineering. Software Crisis, Software Processes & Characteristics.

Software Process Models: Software development life cycle (SWDLC), Software development life cycle models:-Waterfall, Prototype, Evolutionary, RAD and Spiral Models.

Unit II **Software Requirements analysis & specifications:** Requirement analysis tasks, Analysis principles. Requirement elicitation techniques like FAST, QFD, Requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirements documentation, Nature of SRS, Characteristics & organization of SRS.

Unit III **Software Project Management Concepts:** The Management spectrum, The People, The Problem, The Process, The Project.

Software Project Planning: Size Estimation like lines of Code & Function Count, Cost Estimation Models, COCOMO, Risk Analysis.

Unit IV **Software Design:** Design fundamentals, Effective modular design: Data architectural and procedural design, Design documentation. Function Oriented Design, Object Oriented Design.

Cohesion & Coupling: Cohesion & Coupling, Classification of Cohesiveness & Coupling.

Unit V **Software Testing:** Testing Fundamental, Characteristics of Testable Software,Test Characteristics, Testing Techniques:-Black-box testing, White-box testing. Testing Strategies:-Unit Testing, Integration and System Testing.

Software Maintenance: Management of Maintenance, Maintenance Process, Reverse Engineering, Software Re-engineering.

Text/ Reference Books:

1. R. S. Pressman, “Software Engineering – A practitioner’s approach”, McGraw Hill Int. Ed.
2. I. Sommerville, “Software Engineering”, Addison Wesley, 2004
3. Rajib Mall, “Fundamental of Software Engineering”, 3rd Edition, PHI Learning Private Limited
4. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers
5. K. K. Aggarwal&Yogesh Singh, “Software Engineering”, 2nd Ed., New Age International, 2005.
6. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, John Wiley & Sons.
7. PankajJalote, “An Integrated Approach to Software Engineering”, Narosa, 3rd Ed., 2005.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand the importance of the stages in the software life cycle and different Software Process Models.

CO2: Analysis of Software Requirements and preparing SRS.

CO3: Planning and Estimation of software project.

CO4: Understand software designing by applying the software engineering principles.

CO5: Perform Software testing, documentation and maintenance.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1,L2	H	L	H	-	M	M	M	-	L	H	L	L
CO2	L3	M	L	L	L	M	L	H	-	-	H	L	L
CO3	L3	L	M	L	-	M	L	M	-	-	H	L	L
CO4	L2,L3	M	M	H	L	H	L	H	-	-	M	H	M
CO5	L2	M	M	H	L	M	M	M	-	L	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4, CO5
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO3, CO4,CO5

MCA 302: Design and Analysis of Algorithms

Course Objective:

- To analyze the asymptotic performance of algorithms.
- To write the rigorous correctness proofs for algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To apply important algorithmic design paradigms and methods of analysis.

Course Contents:

Unit I: **Background:** Review of Algorithm, Complexity Order Notations: definitions and calculating complexity .Divide And Conquer Method: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.

Unit II: **Greedy Method:** Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. Dynamic Programming: Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem.

Unit III: **Branch And Bound:** Traveling Salesman Problem and Lower Bound Theory.

Backtracking Algorithms and queens problem. Pattern Matching Algorithms: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.

Unit IV: **Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem. Randomized Algorithms- Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.

Unit V: **Problem Classes Np, Np-Hard And Np-Complete:** Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP Complete Problems- Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem.

Text/Reference Books:

1. Design and Analysis of Algorithm; Horowitz and Sahani
2. Introduction to Algorithm Design ; Corman
3. Design and Analysis of Computer Algorithms ; Aho, Pearson

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe Algorithms based on asymptotic analysis and justify the correctness of algorithms.

CO2: Discuss the greedy paradigm and explain when an algorithmic design situation calls for it.

CO3: Practice the divide-and-conquer paradigm

CO4: Describe the dynamic-programming paradigm and analyze it to determine its computational complexity.

CO5: Understand the Problem Classes Np

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	H	-	M	-	L	M	M	L	-	H	H	H
CO2	L2	H	-	L	-	M	M	M	L	-	M	M	M
CO3	L3	M	-	M	-	M	M	L	L	-	H	M	M
CO4	L2	M	-	M	-	M	M	L	L	-	M	M	L
CO4	L2	M	-	M	-	M	M	L	L	-	M	M	L

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	-
CD4	Self- learning advice using internets	CO3,CO4
CD5	Industrial visit	-

MCA 303: J2EE

Course Objectives:

- To understand a good design and programming in Java Programming.
- To Create Java programs that coverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism; use data types, arrays and other data collections.
- To implement the error-handling techniques using exception handling.

Course Contents:

Unit I **The Genesis of Java:** The importance of Java to Internet, Java's magic-the byte code, introduction to JDK and JVM, the Java libraries. Data Types, Variables and Arrays: Java Programming: Data types, access Specifies, operators, control statements, arrays; Classes: Fundamentals, objects, methods, constructors.

Unit II Usage of this keyword, garbage collection, the finalize() method, overloading methods, using objects as parameters, argument passing, returning objects, recursion, introducing access control, understanding static, introducing final, arrays revisited, nested and inner classes, exploring string class, using command-line arguments.

Inheritance: Inheritance basics, using super, creating a multilevel hierarchy, when constructors are called, method overriding, dynamic method dispatch, using abstract, using final with inheritance, the object class.

Unit III **Package, Interfaces:** Packages, access protection, importing packages, interfaces.

Java Library: String handling (only main functions), String Buffer class.Elementary concepts of Input/Output:byte and character streams, System.in and Sysem.out, print and println, reading from a file and writing in a file.

Unit IV **Exception Handling:** exception-handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in exceptions, creating your own exception subclasses, using exceptions.

Multithreaded Programming: The Java thread model, the main thread, creating a thread, creating multiple threads, using Alive() and join(), thread priorities, synchronization, inter thread Communication, suspending, resuming, and stopping threads, using multithreading

Unit V **Applets:** Introduction, Life cycle, creation and implementation, AWT controls: Button, Label, Text Field, Text Area, Choice lists, list, scrollbars, check boxes, Layout managers, Elementary concepts of Event Handling: Delegation Event Model, Event classes and listeners, Adapter classes, Inner classes. Swings: Introduction and comparison with AWT controls.

Text/ Reference Books :

1. E. Balagurusamy, Programming with Java, TMH
2. Herbert Schieldt, The Complete Reference:Java, TMH
3. Horstmann, Core Java, Addison Wesley
4. Rich raposa, Learning Java, Wiley

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand the fundamental concepts of Java Programming language.Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.

CO2: Understand the principles and practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements.

CO3: Implement an application that demonstrates their competency with Java syntax, structure and programming logic, incorporating basic features of the language as well as some features from the I/O (Input/Output) or GUI libraries.

CO4: Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

CO5: Use of Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performance standards.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	H	-	M	-	H	L	M	L	-	H	H	H
CO2	L2	H	-	M	-	H	M	H	L	-	H	H	H
CO3	L3	H	-	M	-	H	L	M	-	-	H	M	M
CO4	L3	H	-	H	-	H	L	H	M	L	M	M	M
CO5	L3	H	-	H	-	H	L	H	M	M	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	--------
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO5

MCA 304: Python Programming

Course Objectives:

- To Understand Programming in Python
- To Implementing data types, statement, operators and strings
- To Implementing OOPs concept in Python
- To Creating GUI applications using Python
- To Connecting with databases
- To Implementing TCP socket connectivity

Course Contents:

Unit I: **Introduction to Python:** Python Installation and Working of it, get familiar with python variables and data types, Operator understanding and its usage, detail study of python blocks,

Structure Types and mutability: Hands on with conditional blocks using if, else and elif, Hands on examples and study of looping with range, list and dictionaries. hands on to organize python code with function, modular approach in python.

Unit II: **Exception, Testing and Debugging**: Handling if exceptions to handle the code cracks, handling and helping file operations, coding with the exceptional handling and testing Anonymous method, Properties, Indexers, Exception Handling

Classes and OOP Concepts: Procedural and Object-Oriented Programming, Classes and working with instances, Method overloading, Polymorphism, importing internal module as well as external modules in the code Packages understanding and their usage, hands on with Lamba function in python coding with the use of functions, modules and external packages

Unit III: **Algorithm and Data Structure:** Stack, Queue, Tree, ordered list, Introduction to Recursion, Divide and Conquer Strategy, Greedy Strategy, Graph Algorithms.

Advance Topics: Regular Expression, Multi thread Programming, Security

Unit IV: **Using Databases in Python:**,Python MySQL Database Access,Install the MySQLdb and other Packages, Create Database Connection, CREATE, INSERT, READ, UPDATE and DELETE Operation, DML and DDL Oepration with Databases, Performing Transactions, Handling Database Errors

Unit V: **Python For Data Analysis:**Numpy: Introduction to numpy Creating arrays Using arrays and Scalars Pandas: What is pandas? Where it is used? Series in pandas, Matplotlib: Python For Data Visualization

Text/Reference Books:

1. Starting Out with Python (2009) Pearson ,Tonny Gaddis

2. Beginning PyhtonWrox Publication Peter Norton, Alex Samuel

3. Python Algorithms Apress, Magnus LietHetland,

4. Python Object Oriented Programming PACKT Press, Dusty Phillips

5. Python for Unix and Linux System Administration O'Relly, Noad Gift

Course Outcomes:

CO1: Learn basics of Python

CO2: Develop console application in python

CO3: Implement Data structures using python.

CO4: Develop database application in python

CO5: Use various data analysis libraries available in Python

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L2	H	-	M	-	M	L	H	M	-	M	M	M
CO2	L2	H	-	L	-	H	H	M	-	-	L	H	M
CO3	L3	M	-	M	-	H	M	H	L	L	L	H	H
CO4	L6	M	-	M	-	H	M	H	L	L	L	H	H
CO5	L2	M	-	M	-	H	M	H	L	L	L	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO3
CD5	Industrial visit	CO5

MCA 305: Cloud Computing

Course Objectives:

- To understand the basics of Cloud Computing.
- To understand the movement from a traditional network infrastructure to a Cloud solution.

Course Contents:

Unit I: **Introduction:** Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges ,Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things

Unit II: **Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and inter connection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.

Unit III: **Virtualization Technology:** Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre

Unit IV: **Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture .Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation, Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management

Unit V: **Cloud Platforms in Industry:** Amazon web services , Google App Engine, Microsoft Azure Design, Aneka: Cloud Application Platform-Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM

Text/ Reference Books:

1. " Distributed and Cloud Computing " By Kai Hawang , GeofreyC.Fox, Jack J. Dongarra Pub: Elservier
2. Cloud Computing ,Principal and Paradigms, Edited By RajkumarBuyya, JemesBroberg, A. Goscinski,
3. Pub.- Wiley
4. Kumar Saurabh, "Cloud Computing" , Wiley Pub
5. Krutz , Vines, "Cloud Security " , Wiley Pub
6. Velte, "Cloud Computing- A Practical Approach" ,TMH Pub

Course Outcomes:

CO1: Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.

CO2: Design different workflows according to requirements and apply map reduce programming model.

CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds and societal issues involved in addressing the security issues of cloud computing.

CO5: Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L4	H	-	L	-	M	L	M	L	-	L	H	H
CO2	L6	H	-	M	-	L	M	L	-	-	M	H	H
CO3	L3	H	-	L	-	M	L	M	-	-	M	M	M
CO4	L6	M	-	M	-	M	L	M	-	-	H	H	H
CO5	L5	M	-	L	-	L	L	L	L	-	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO5
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	CO4,CO5

MCA 306.A Internet of Things

Course Objectives:

- To explore the interconnection of the physical world and the cyber space.
- To develop & design the IOT Devices and communication models.

Course Contents:

Unit I: **Introduction to IoT:** Definition and characteristics of IoT, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs,

Unit II **IOT enabling Technologies-** Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.

Unit III **IoT Hardware and Software:** Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIoTOS, Contiki OS, Tiny OS.

Unit IV **Architecture and Reference Model:** Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, Other challenges.

Unit V **IOT and M2M:** M2M, Difference and similarities between IOT and M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Case study of IoT Applications: Domain specific IOTs- Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyles.

Reference Books:

1. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013, ISBN: 9781-118-43062-0 2. Daniel Kellmereit, “The Silent Intelligence: The Internet of Things”. 2013, ISBN 0989973700

Course Outcomes:

At the end of the course, the student will be able to:

CO1 Understand the building blocks of Internet of Things and characteristics and application areas of IOT.

CO2: Understand of IOT enabling Technologies.

CO3: Implement interfacing of various sensors with Arduino/Raspberry Pi.

CO4: Implement Architecture and Reference Model for in IoT- Design and security aspects

CO5: Understand the revolution of Internet in Mobile Devices, Cloud & Sensor Networks and implementation of automation in different domain.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L2	H	-	H	-	M	L	L	L	-	M	M	M
CO2	L3	H	-	L	-	M	L	M	-	-	M	H	H
CO3	L3	H	-	L	-	M	M	M	-	-	M	M	M
CO4	L3	H	-	L	-	M	M	M	-	-	M	M	M
CO5	L2	H	-	L	-	M	M	M	-	-	M	M	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO4,CO5
CD4	Self- learning advice using internets	CO2
CD5	Industrial visit	CO5

MCA 306.B: Information Security System

Course Objectives:

- This course focuses on the models, tools, and techniques for enforcement of security with some emphasis on the use of cryptography.
- To develop an understanding of security policies (such as authentication, integrity and confidentiality).

Course Contents:

Unit I Multi level model of security, Cryptography, Secret Key Cryptography, Modes of Operation, Hashes and Message Digest, Public Key Algorithm, Security Handshake Pitfall, Strong Password Protocol; Case study of real time communication security;

Unit II Introduction to the Concepts of Security, Security Approaches, Principles of security, Types of attacks; Cryptographic Techniques: Plain text and Cipher text, Substitution Techniques, Transposition Techniques Encryption and Decryption, Symmetric and Asymmetric Key Cryptography. Computer-based symmetric Key Cryptographic;

Unit III Algorithms: Algorithm Types and Modes, An Overview of Symmetric Key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), Advanced Encryption Standard (AES);

Computer-based Asymmetric Key Cryptographic Algorithms; Cryptography, An Overview of Asymmetric Key Cryptography, The RSA algorithm, Symmetric and Asymmetric Key Cryptography Together, Digital Signatures, Knapsack Algorithm;

Unit IV Public Key Infrastructure (PKI) Digital Certificates, Private Key Management , The PKI Model, Public Key Cryptography Standards (PKCS); Internet Security Protocols Secure Socket Layer (SSL) , Secure Hyper Text Transfer Protocol (SHTTP) , Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, 3-D Secure Protocol , Electronic Money , Email Security;

Unit V User Authentication Mechanisms : Authentication Basics, Passwords, Authentication Tokens, Certificate-based Authentication; Practical Implementations of Cryptography/Security: Cryptographic Solutions Using Java, Cryptographic Solutions Using Microsoft, Cryptographic Toolkits, Security and Operating Systems; Network Security: Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN); Case Studies on Cryptography and Security:

Text/Reference Books:

1. AtulKahate "Cryptography and Network Security" Tata McGraw-Hill
2. Charlie Kaufman,RadiaPerlman,MikeSpeciner" Network Securities" Pearson,
3. J. A. Coopeer "Computer Communication Securities"TMH,
4. D.W. Davies W. L. Price "securities For computer Networks"
5. John Wiley Sons, L.Stein "Web Securities A step by step Guide " Addison Wesley.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Understand, compare and apply different encryption and decryption

CO2: Understand thesecurity, cryptography, system attacks and defences against them

CO3: Apply and evaluate the performance of different algorithms for cryptography and encription.

CO4: Learn Key management system for security management system.

CO5: Apply User Authentication Mechanisms techniques to solve problems related to confidentiality and authentication.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	H	-	M	-	H	M	M	L	-	H	M	M
CO2	L4	H	-	L	-	M	M	M	-	-	M	M	M
CO3	L3	M	-	M	-	M	M	L	-	-	H	H	H
CO4	L3	M	-	M	-	M	M	H	-	-	M	H	H
CO5	L3	M	-	M	-	M	M	H	-	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3
CD2	Tutorials/Assignments	CO2, CO4
CD3	Seminars	
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	

MCA 306.C: Data Miningand Warehouse

Course Objectives:

- To Approach business problems data-analytically by identifying opportunities to derive business value from data.
- To Know the basics of data mining techniques and how they can be applied to extract relevant business intelligence

Course Contents:

Unit- I **The Compelling Need for data warehousing:** Escalating Need for strategic information, failures of Past decision-support systems, operational versus decision-support systems, data warehousing – the only viable solution, data warehouse defined Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, metadata in the data warehouse Defining the business requirements: Dimensional analysis, OLAP operations : Drill-down and roll-up, slice-and-dice or rotation

Unit- II **Principles of dimensional modeling:** the STAR schema, STAR Schema Keys, Advantages of the STAR Schema Dimensional Modeling: Updates to the Dimension tables, miscellaneous dimensions, the snowflake schema, aggregate fact tables, families of STARS ,Steps for the Design & Construction of Data warehouse : Framework , Architecture , Type of OLAP Servers : ROLAP , MOLAP , Data warehouse implementation tolls & techniques.

Unit- III Data Mining, Data Mining of what kind of Data , Knowledge discovery process (KDD) , What kind of patterns can be mined , OLAP versus data mining, data mining and the data warehouse, Data mining functionalities, classification Systems , Data processing : Cleaning , Integration & transformation, Reduction .

Unit- IV **Data Mining primitives:** What defines a Data Mining Task. Languages and System Architectures, Association Rule Mining, Mining of Single dimensional Boolean association rules.

Unit- V **Data Mining Query language (DMQL), Cluster Analysis:** Partitioning, Hierarchical Density, Grid & Model based methods, Major Data Mining Techniques, Cluster detection, decision trees, memory-based reasoning, link analysis, neural networks, genetic algorithms, moving into data mining, Data Mining Applications, Benefits of data mining & applications.

Text Books:

1. Jiawei Han, MichelineKamber, “Data Mining concepts and Techniques”, Elsevier.
2. Paul Raj Poonia, “Fundamentals of Data Warehousing”, John Wiley & Sons, 2003.
3. W. H. Inmon, “Building the Operational Data Store”,2nd Ed., John Wiley, 1999
4. Sam Anahony, “Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems”, John Wiley, 2004.
5. Jarke, “Fundamentals of Data Warehouse”, Springer

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Analyze the Need for data warehousing and Define Features of Data mining.

CO2: Understand dimensional modeling and Steps for the Design & Construction of Data warehouse.

CO3: Discover Data mining for Knowledge discovery to solve problems and Data processing.

CO4: Understand the Data Mining primitives.

CO5: Apply Data Mining Query language for data mining for Business Intelligence Application.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	H	-	M	-	M	M	M	-	-	M	H	H
CO2	L2	H	-	M	-	M	L	M	-	-	M	H	H
CO3	L6	H	-	M	-	M	L	L	-	-	H	H	H
CO4	L6	H	-	M	-	M	M	M	M	-	M	H	H
CO5	L3	H	-	M	-	M	M	M	M	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	-

MCA307: J2EE LAB

Course Objectives:

- To understand object oriented features of java and implementing it in java programming.
- To learn and understand inheritance, interfaces, multithreading and exception handling.
- To understand different input/output objects (input vs. output, character vs. byte, data vs. processing, object) and methods and the structure of the java.io package.
- To learn and understand the use of applets and file handling.

List of experiments

Practical 1: Write a program to compute the sum of the digits of a given integer number.

Practical 2: Given a number, write a programming using (while/ do..while/for) loop to reverse the digits of the number. For example, the number 12345 should be written as 54321.

Practical 3: Write a program (making use of class and methods), which will read a string and rewrite it in the alphabetical order. For example, the word JAIPUR should be written as AIJPRU.

Practical 4: Write a program that accepts a shopping list of five items from the command line and stores them in a vector.

Practical 5: Write a program to show the application of interface and abstract class.

Practical 6: Define an exception called “No Match Exception” that is thrown when a string is not equal to “India”. Write a program that uses this exception.

Practical 7: Write a program to implement multithreading making use of Thread class and/or Run able interface.

Practical 8: Write a program to implement the concept of packages.

Practical 9: Develop an applet that receives three numeric values as input from the user and then displays the largest of the three on the screen. Write a HTML page and test the applet.

Practical 10: Develop an applet which runs a banner with text “Welcome to JaganNath University” making use of multithreading.

Course Outcomes:

At the end of the course, a student will be able to

CO1. Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.

CO2. Read and make elementary modifications to Java programs that solve real-world problems. And Identify Java code utilities in applets, Java packages, and classes.

CO3. Analyze a computer program to solve specified problems and to use the Java SDK environment to create, debug and run simple Java programs.

CO4. Develop programs for inheritance, multithreading, applets, exception handling and file handling.

CO5: Write multithreaded programs HTML page and test the applet

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	H	-	H	-	H	M	H	-	-	H	H	H
CO2	L3	H	-	H	-	H	L	M	-	-	M	H	H
CO3	L4	H	-	H	-	H	-	M	L	-	M	M	M
CO4	L6	H	-	H	-	H	L	H	M	-	M	H	H
CO5	L6	H	-	H	-	H	L	H	M	-	M	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	----------
CD4	Self- learning advice using internets	CO1,CO2, CO3, CO4
CD5	Industrial visit	CO2,CO3, CO4

MCA 308: Python Programming Lab

Course Objective:

- To describe the need for Object-oriented programming concepts in Python.
- To infer the supported data structures like lists, dictionaries and tuples in Python.
- To illustrate the application of matrices and regular expressions in building the Python programs.
- To discover the use of external modules in creating excel files and navigating the file systems.

List of Experiments

1. Write a program to demonstrate basic data type in python.
2. Write a program to compute distance between two points taking input from the user
3. Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
4. Write a Program for checking whether the given number is an even number or not.
5. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
6. Write a Program to demonstrate list and tuple in python.
7. Write a program using for loop that loops over a sequence.
8. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
9. Find the sum of all the primes below two million.
10. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
11. Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
12. Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
13. Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
14. Write a program to print each line of a file in reverse order.
15. Write a program to compute the number of characters, words and lines in a file.
16. Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on.
17. Write function to compute gcd, lcm of two numbers. Each function shouldn’t exceed one line.
18. Write a program to implement Merge sort.
19. Write a program to implement Selection sort, Insertion sort.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Create, Test and Debug Python Programs

CO2: Implement Conditionals and Loops for Python Programs

CO3: Use functions and represent Compound data using Lists, Tuples and Dictionaries

CO4: Read and write data from & to files in Python and develop Application using Python.

CO5: Illustratesortmethods in Python Programs.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Mapping of Course Outcomes onto Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L6	H	M	M	M	M	-	-	-	L	M	L	L	M	M
CO2	L3	M	M	M	M	L	-	-	-	M	M	L	M	H	M
CO3	L2	H	L	H	L	M	-	-	-	L	L	L	M	H	H
CO4	L6	H	M	H	M	M	-	-	-	M	M	M	L	H	H
CO5	L3	M	M	M	M	L	-	-	-	M	M	L	M	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	-
CD4	Self- learning advice using internets	CO2, CO3, CO4
CD5	Industrial visit	-

MCA 309: Industrial Training / Seminar

Course Objectives:

- To acquire and apply fundamental principles of engineering.
- To identify, formulate and present model problems.
- To find engineering solutions based on a practical approach.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Capability to acquire and apply fundamental principles of engineering.

CO2: Become master in one's specialized technology

CO3: Become updated with all the latest changes in technological world.

CO4: Ability to identify, formulate and model problems and find engineering solution based on a systems approach.

Table: Mapping of Course Outcomes with Program Outcomes

Course Outcome	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2
CO1	L2	M	H	L	H	L	-	-	-	-	L	-	L	M	M
CO2	L3	M	L	H	H	L	-	-	-	-	L	-	M	H	M
CO3	L6	M	H	M	M	L	-	-	-	-	L	-	M	M	M
CO4	L2	M	M	M	M	L	-	-	-	-	M	-	L	M	H

H- High, M- Moderate, L- Low, '-' for No correlation

FOURTH SEMESTER

THEORY PAPERS		**Hours**			**Marks Allocation**			
Code	**Subject/Paper**	**L**	**T**	**P**	**IA**	**EA**	**Total**	**Credits**
MCA 401	Software Project Management	3	1	-	30	70	100	4
Elective(Select any one)								
MCA 402.A	Big Data Analytics	4	0	-	30	70	100	4
MCA 402.B	Machine Learning	4	0	-	30	70	100	4
MCA 402.C	Soft Computing	4	0	-	30	70	100	4
PRACTICALS/VIVA-VOCE		**Hours**			**Sessional**	**Practical**	**Total**	**Credits**
MCA 403	Industrial Project	-	-	6	180	120	300	6
TOTAL		7	**1**	**6**	**240**	**260**	**500**	**14**

MCA 401: Software Project Management

Course Outcomes:

- Identify the different project contexts and suggest an appropriate management strategy.
- Practice the role of professional ethics in successful software development.
- Identify and describe the key phases of project management.
- Determine an appropriate project management approach through an evaluation of the business context and scope of the project.
- Understand the fundamental principles of software project management & have a good knowledge of responsibilities of project manager.

Course Contents:

Unit- 1 **Project Management:** The management spectrum, the people, the product, the process, the project, the W5HH principle, critical practices Metrics for Process and Project: Metrics in the process and project Domains, software measurements, metrics for software quality, integrating metrics within software process, metrics for small organizations, establishing a software metrics program.

Unit II **Estimation:** Observations, Project planning Process, software scope and feasibility, resources, software project estimation, decomposition techniques, empirical estimation models, estimation for object oriented projects, estimation for Agile development and web engineering projects, the make/buy decision.

Unit III **Project Scheduling:** Basic concepts, project scheduling, defining a task set and task network, scheduling, earned value analysis. Risk Management: Reactive V/S proactive Risk Strategies, software risks, Risk identification, Risk projection, risk refinement, risk mitigation, monitoring and management, the RMMM plan Quality Planning: Quality Concepts, Procedural Approach to Quality Management, Quantitative Approaches to Quality Management, Quantitative Quality Management Planning, Setting the Quality Goal, Estimating Defects for Other Stages, Quality Process Planning, Defect Prevention Planning.

Unit IV **Quality Management:** Quality Concepts, Software Quality assurances, software reviews, formal technical reviews, Formal approaches to SQA, Statistical Software Quality assurances, Change Management: software Configuration Management, The SCM repository, SCM Process, Configuration Management for Web Engineering

Unit V **Project Execution And Closure:** Reviews. The Review Process, Planning, Overview and Preparation, Group Review Meeting, Rework and Follow-up, One-Person Review, Guidelines for Reviews in Projects, Data Collection, Analysis and Control Guidelines, Introduction of Reviews and the NAH Syndrome. Project Monitoring and Control: Project Tracking, Activities Tracking, Defect Tracking, Issues Tracking, Status Reports, Milestone Analysis, Actual Versus Estimated Analysis of Effort and Schedule, Monitoring Quality, Risk-Related Monitoring. Project Closure: Project Closure Analysis, The Role of Closure Analysis, Performing Closure Analysis.

Text/References:

1. R. S. Pressman, Software Engineering, TMH, 7th ed.
2. PankajJalote, Software project management in practice, Addison-Wesley
3. B. Hughes & M. Cotterell, Software Project Management, TMH

Course Outcomes:

At the end of the course, the student will be able to:

CO: 1. Explain principles of the project lifecycle and how to identify opportunities to work with learners on relevant and appropriate project scenarios to share this understanding

CO: 2. Critically evaluate and discuss the issues around project management and its application in the real world with course participants and learners

CO: 3. Choose project management techniques for IT projects to initiate, plan, execute and evaluate a project and work in teams to create a project plan for a project scenario that includes key tasks, critical path, dependencies and a realistic timeline.

CO: 4. Present strategies for gaining confidence in managing projects through simple project planning examples

CO: 5. Review, Project Execution and closure

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L6	H	-	H	-	H	M	L	-	-	H	M	M
CO2	L2	M	L	H	-	L	M	L	-	-	H	H	H
CO3	L3	H	M	M	L	L	L	M	M	-	M	M	M
CO4	L3	H	M	M	L	L	L	M	M	-	M	M	M
CO5	L2	H	M	M	L	L	L	M	M	-	M	M	M

H-High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO2

MCA 402.A: Big Data Analytics

Course Objectives:

- To provide an overview of an exciting growing field of big data analytics.
- To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map Reduce.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support

Course Contents:

Unit I **Introduction to Big Data**: Big data features and challenges, Problems with Traditional Large-Scale System , Sources of Big Data, 3 V's of Big Data, Types of Data. Working with Big Data: Google File System.Hadoop Distributed File System (HDFS) - Building blocks of Hadoop (Namenode. Data node.Secondary Namenode.Job Tracker. Task Tracker), Introducing and Configuring Hadoop cluster (Local. Pseudodistributed mode, Fully Distributed mode). Configuring XML files.

Unit II **Writing Map Reduce Programs:** A Weather Dataset. Understanding Hadoop API for Map Reduce Framework (Old and New). Basic programs of Hadoop Map Reduce: Driver code. Mapper code, Reducer code. Record Reader, Combiner, Partitioner.

Unit III **Hadoop I/O:** The Writable Interface. Writable Comparable and comparators. Writable Classes: Writable wrappers for Java primitives. Text.Bytes Writable.Null Writable, Object Writable and Generic Writable.Writable collections.Implementing a Custom Writable: Implementing a Raw Comparator for speed, Custom comparators.

Unit IV **Pig:** Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow. Working through the ABCs of Pig Latin.Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

Unit V **Applying Structure to Hadoop Data with Hive:** Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive.Examining the Hive Clients.Working with Hive Data Types.Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

Text/ Reference Books :

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" by EMC Education Services
2. "Big Data: Does Size Matter?" by TimandraHarkness
3. "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses" by Michael Minelli

Course Outcomes:

At the end of the course, Students will be able to:

CO1: Understand the key issues in big data management and its associated applications and analyze the Big Data framework like Hadoop.

CO2: Give examples of Basic programs of Hadoop Map Reduce.

CO3: Implement the Writable interface, Writable Comparable, Writable Generic, collections.

CO4: Implement of Big Data Analytics using pig to solve data intensive problems and to generate analytics.

CO5: Apply Structure to Hadoop Data with Hive.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table :Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L2	M	-	H	-	L	L	M	L	-	M	L	L
CO2	L1	H	-	M	-	M	-	M	L	-	M	H	M
CO3	L3	H	-	L	-	L	L	H	-	-	M	M	M
CO4	L3	M	-	M	-	M	-	M	L	-	H	H	H
CO5	L3	M	-	M	-	M	-	M	L	-	H	H	H

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO5

MCA 402.B: Machine Learning

Course Objectives:

- To introduce students to the basic concepts and techniques of **Machine Learning**.
- To develop skills of using recent **machine learning** software for solving practical problems.
- To gain experience of doing independent study and research.

Course Contents:

Unit I: **Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naïve Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random forest algorithm

Unit II: **Unsupervised learning algorithm:** Grouping unlabelled item susing k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.

Unit III: Introduction to Statistical Learning Theory, Feature extraction-Principal component analysis, Singular value decomposition. Feature selection–feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.

Unit IV: **Semi supervised learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.

Unit V: Recommended system, Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Back propagation, Introduction to Deep learning.

Reference/Text Books:

1. Tom M Mitchell, Machine Learning, McGraw Hill Education
2. Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.
3. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
4. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995. ISBN: 9780198538646.
5. Introduction to MachineLearning - EthemAlpaydin, MIT Press, Prentice hall of India.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe intelligent agents for search and games

CO2: Convert AI problems through programming with Python

CO3: Learning optimization and inference algorithms for model learning

CO4: Make programs for an agent to learn and act in a structured environment.

CO5: Learn recommended system in ML.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L1	H	M	M	M	M	M	-	-	-	M	M	M
CO2	L2	M	M	H	M	L	-	-	-	-	M	M	M
CO3	L1	M	H	M	H	-	-	-	-	-	H	H	M
CO4	L3	H	M	H	M	M	-	M	-	-	M	H	M
CO5	L1	M	H	M	H	-	-	-	-	-	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	**Course Delivery methods**	**Course Outcomes**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	CO4

MCA 402.C: Soft Computing

Course Objectives:

- To conceptualize the working of human brain using ANN.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation.

Course Contents:

Unit I Introduction to Soft Computing:

Aims of Soft Computing-Foundations of Fuzzy Sets Theory-BasicConcepts and Properties of Fuzzy Sets-Elements of Fuzzy Mathematics-Fuzzy Relations-Fuzzy Logic

Unit II Application of Fuzzy Sets:

Applications of Fuzzy Sets-FuzzyModeling–Fuzzy DecisionMaking-Pattern Analysis and Classification-Fuzzy ControlSystems-Fuzzy Information Processing-Fuzzy Robotics.

Unit III Artificial Neural Networks:

Artificial Neural Networks-Models of Neuron-Architecture of FeedForward Neural Networks, Recurrent Neural Networks-Learningmethods-supervised and unsupervised learning-Time DelayNeural Networks-Radial Basis Function Neural Networks-Adaptive Resonance Theory (ART) Neural Networks-Associative Neural Memory Models-Application of ANN

Unit IV Genetic Algorithms:

Main Operators-Genetic Algorithm Based Optimization-Principleof Genetic Algorithm-Genetic Algorithm with Directed Mutation-Comparison of Conventional and Genetic Search Algorithms-Issues of GA in practical implementation.Introduction to Particleswarm optimization-PSO operators-GA and PSO in engineeringapplications

Unit V Neuro-Fuzzy Technology:

Fuzzy Neural Networks and their learning-Architecture of Neuro-Fuzzy Systems-Generation of Fuzzy Rules and membership functions- Fuzzification and Defuzzy fication in Neuro-Fuzzy Systems-Neuro-Fuzzy Identification-Neuro Fuzzy

Control-Combination of Genetic Algorithm with Neural Networks-Combination of Genetic Algorithms and Fuzzy Logic-Neuro-Fuzzyand Genetic Approach in engineering applications.

Programming Using Matlab: Using Neural Network toolbox–Using Fuzzy Logic toolbox-Using Genetic Algorithm & directed search toolbox.

Text Books:

1. Sivanandam.S.N, Deepa.S.N, "Principles of soft computing",2ndEdition,Wiley India Pvt Limited, 2011
2. JuhShing Roger Jang, Cheun Tsai Sun, EijiMizutani, "Neuro fuzzy andsoft computing", Prentice Hall, 1997.

References:

1. Aliev,R.A, Aliev,R.R, "Soft Computing and its Application", WorldScientific Publishing Co. Pvt. Ltd., 2001.
2. Mehrotra.K, Mohan.C.K, Ranka.S, "Elements of Artificial NeuralNetworks", The MIT Press, 1997.
3. JuhShing Roger Jang,Cheun Tsai Sun,EijiMizutani, "Neuro fuzzy andsoft computing", Prentice Hall, 1997.
4. Ronald R.Yager, LoftiZadeh, "An Introduction to fuzzy logic applicationsin intelligent Systems", Kluwer Academic, 1992.
5. Cordón.O, Herrera.F, Hoffman.F, Magdalena.L "Genetic Fuzzy systems", WorldScientific Publishing Co. Pvt. Ltd., 2001.

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Demonstrate the applications which can use fuzzy logic.

CO2: Define design inference systems.

CO3. Understand the difference between learning and programming and explore practical applications of Neural Networks (NN).

CO4. Demonstrate the importance of optimizations and its use in computer engineering fields and other domains.

CO5. Understand the efficiency of a hybrid system and how Neural Network and fuzzy logic can be hybridized to form a Neuro-fuzzy network and its various applications.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L3	H	M	H	M	-	-	-	-	L	M	L	M
CO2	L1	M	H	M	H	-	-	-	-	M	H	L	M
CO3	L2	H	M	L	M	-	-	-	-	H	M	M	M
CO4	L3	M	H	M	H	-	-	-	-	M	H	M	M
CO5	L2	H	H	L	H	-	-	-	-	L	H	H	M

H- High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3,
CD2	Tutorials/Assignments	CO2, CO3
CD3	Seminars	CO3, CO4,
CD4	Self- learning advice using internets	CO2, CO3
CD5	Industrial visit	-

MCA 403: Industrial Project

Course Objective:

- To introduce the concept and methods required for theconstruction of large software intensive system.
- To develop a broad understanding of the discipline of software engineering and management of software system.
- To provide an understanding of both theoretical and methodological issues involve in modern software engineering project management and focus strongly on practical techniques.

Course Outcomes

At the end of the course, the student will be able to:

CO1: Understand programming language concepts, particularly Development languages and object-oriented concepts or go through research activities.

CO2: Plan, analyze, design and implement a software project or gather knowledge over the field of research and design or plan about the proposed work.

CO3: Demonstrate the ability to locate and use technical information from multiple sources.

CO4: Demonstrate the ability to communicate effectively in speech and writing.

CO5: Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Self- learning advice using internets
CD5	Industrial visit

Table : Mapping of Course Outcomes with Program Outcomes

Course Outcomes	Bloom Level	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PSO 1	PSO 2
CO1	L2	L	H	L	M	H	H	M	M	L	M	H	H
CO2	L6	M	M	H	M	M	M	L	M	M	M	H	H
CO3	L3	H	H	H	H	H	L	M	L	L	M	H	H
CO4	L3	M	M	L	L	M	H	H	L	M	H	H	H
CO5	L5	M	H	L	M	H	L	H	M	M	H	H	H

H-High, M- Moderate, L- Low, '-' for No correlation

Mapping between CO and CD

CD	Course Delivery methods	Course Outcomes
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1,CO2,CO3,CO4,CO5
CD2	Tutorials/Assignments	CO1,CO2,CO3,CO4,CO5
CD3	Seminars	CO3, CO4, CO5
CD4	Self- learning advice using internets	CO1,CO2,CO3,CO4,CO5
CD5	Industrial visit	CO2, CO3

11. TEACHING-LEARNING PROCESS/ METHODOLOGY (TLM):

The teaching-learning process should be aimed at systematic exposition of basic concepts so as to acquire knowledge of technical program in a canonical manner. In this context, applications of technical program and linkage with the theory constitute a vital aspect of the teaching-learning process. The course offers many modes of learning and assessment methods. Students have great freedom of choice of course which they can study. The various components of teaching learning process are summarized in the following heads.

1. **Class room Lectures:** The most common method of imparting knowledge is through lectures. There are diverse modes of delivering lectures such as through blackboard, power point presentation and other technology aided means. A judicious mix of these means is a key aspect of teaching-learning process.
2. **Tutorials:** To reinforce learning, to monitor progress, and to provide a regular pattern of study, tutorials are essential requirements. During these tutorials, difficulties faced by the students in understanding the lectures, are dealt with. Tutorials are also aimed at solving problems associated with the concepts discussed during the lectures.
3. **Practical:** To provide scientific visualization and obtaining results of Technical programming practical sessions. These sessions provide vital insights into scientific concepts and draw learner's attention towards limitations of scientific computations. During practical, scientific models arising in real life problems can also be simulated.
4. **Choice based learning/Open elective:** LOCF in this under Post Graduate program provides great flexibility both in terms of variety of courses and range of references in each course.
5. **Field based learning:** Students may enhance their knowledge through field based learning while understanding the practical importance.
6. **Textbooks learning:** A large number of books are included in the list of references of each course for enrichment and enhancement of knowledge.
7. **E-learning:** Learner may also access electronic resources and educational websites for better understanding and updating the concepts.
8. **Self-study materials:** Self-study material provided by the teachers is an integral part of learning. It helps in bridging the gaps in the classroom teaching. It also provides scope for teachers to give additional information beyond classroom learning.
9. **Assignment/Problem solving:** Assignments at regular intervals involving applications of theory are necessary to assimilate basic concepts of courses. Hence, it is incumbent on the part of a learner to complete open-ended projects assigned by the teacher.
10. **Internships:** The teaching-learning process needs to be further supported by other activities devoted to subject-specific and interdisciplinary skills, summer and winter internships. During these internships it is expected that a learner will interact with experts and write a report on a topic provided to the learner.

11. **Institute visits:** Institute visit by a learner is also a part of learning process. During such visits a learner has access to knowledge by attending academic activities such as seminars, colloquia, library consultation and discussion with faculty members. These activities provide guidance and direction for further study.
12. **Industrial visits:** Industrial visits offer an opportunity to observe applications of scientific concepts. These visits also give an opportunity to realize the power of mathematical ideas and their translation in problem solving.
13. **Training programs:** Training programs organized by various agencies/institutes provide an opportunity to learn various dimensions of courses.

12. ASSESSMENT AND OUTCOME MESUAREMENT METHODS (AOMM):

A range of assessment methods which are appropriate to test the understanding of various concepts of courses will be used. Various learning outcomes will be assessed using time-bound examinations, problem solving, assignments and viva-voce examination. For various courses in this program, the following assessment methods shall be adopted:

i. Scheduled/unscheduled tests
ii. Problem solving sessions aligned with classroom lectures
iii. Practical assignments
iv. Regular chamber consultation with faculty members
v. Mid semester examination and semester end comprehensive examination

Examination and Evaluation:

I. The medium of instructions and examination shall be Bilingual.
II. Candidates shall be examined according to the scheme of examination and syllabus as approved by the BOS and Academic Council from time to time.
III. To pass each semester examination, a candidate must obtain at least 40% marks in each paper, practical work in semester examination.
IV. Each theory paper for the respective semester examination shall be set and evaluation of the answer books shall be done as per the University rules.
V. The assessment of External Evaluation i.e. End Term Semester Examination will be made out of 70 (Seventy) marks in theory Papers and Internal Evaluation of 30 (Thirty) marks.

Criterion for awarding Grading System:

Criterion for Awarding SGPA and CGPA: The criterion for awarding the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) for MCA. Program shall be as follows:

a) The criterion for passing in a subject is that a student should secure minimum 40% marks in individual paper.

b) A student obtaining less than pass marks as specified above, in each subject (sum of internal and End-Term examinations) he will be declared fail in that subject and will have to re-appear in a End-Term examination of the course in subsequent odd / even semester end term examination, subject to maximum permissible period of n+2 semesters to complete the course.

c) The University has adopted Absolute Grading System for converting marks into grades. The formula of 10- point grading system for conversion of marks obtained into Letter Grades and converting Letter Grades to Grade Point is given below:

Table: Marks, Letter Grades and Grade Points

Marks	Letter Grade	Grade Points
91-100	O (Outstanding)	10
81-90	A+(Excellent)	9
71-80	A(Very Good)	8
61-70	B+(Good)	7
51-60	B(Above Average)	6
46-50	C(Average)	5
40-45	P (Pass)*	4
0-39	F(Fail)	0
-	AB (Absent)	0

***Pass Mark: 40% in individual paper**

d) While converting the marks into Letter Grade, the rounding off marks must be considered.

e) A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

f) For noncredit courses "Satisfactory" or Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Computation of SGPA and CGPA:

The university has adopted UGC recommended procedure for computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

a) The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the papers/ courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = Σ (Ci x Gi) / ΣCi

Where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course. The university shall issue Semester Grade Card to the student.

b) The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

CGPA = Σ (Ci x Si) / Σ Ci

Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

c) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Illustration of Computation of SGPA and CGPA and Format for Transcripts:

a) Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course/Paper 1	3	A	8	3x8=24
Course/Paper 2	4	B+	7	4x7=28
Course/Paper 3	3	B	6	3x6=18
Course/Paper 4	3	O	10	3x10=30
Course/Paper 5	3	C	5	3x5=15
Course/Paper 6	4	B	6	4x6=24
	20			**139**

Thus, SGPA= 139/20= 6.95

b) Illustration for CGPA

Semester-1	Semester-2	Semester-3	Semester-4
Credit: 20	Credit: 22	Credit: 25	Credit: 26
SGPA:6.9	SGPA:7.8	SGPA:5.6	SGPA:6.0

Thus, CGPA = 20x6.9+22x7.8+25x5.6+26x6.0=

---------- = **6.50**

13. TEACHERS TRAINING (TT):

Learning Outcomes Based Curriculum Framework (LOCF) Quality initiative of UGC based on Outcome Based Education (OBE) is being implemented by the University Grants Commission to enhance the Quality of Higher Education and that

of Higher Education Learners and Teachers. Therefore, university arrange following activities for teachers training:

1. Workshops for LOCF implementation.
2. Seminar for LOCF implementation.
3. FDP on LOCF.
4. Outcome based higher education and understanding the learning objectives, learning outcomes, new approaches in the area of outcome measurement, preparing future ready teachers and students.
5. Developing a battery of quality speakers/educators to become resource persons to play role for Training of Trainers (TOT).

14. KEY WORDS:

LOCF, CBCS, Course Learning Outcomes, Employability, Post Graduate Attributes Communication Skills, Critical Thinking, and Descriptors.