Indira Gandhi University Meerpur, Rewari

(A State University established under Haryana Act No.29 of 2013)
Recognized u/s 12 (b) & amp; 2(f) of UGC Act, 1956

Examination Scheme &Syllabus for Master of Computer Applications (Semester-I to IV)

OUTCOME BASED EDUCATION SYSTEM /

LEARNING OUTCOME CURRICULUM FRAMEWORK

OBES / LOCF, CBCS CURRICULUM(w.e.f. 2020-21)

Approvedby : ApprovalStatus:	**PGBoS** √	**Discussed in DC Meeting** √	**AcademicCouncil** √
ApprovalDate :	30.05.2023 19.12.2022 13.07.2021	03-05-2023 05.04.2022	15.06.2023 09-12-2022

VISIONANDMISSION

VISIONANDMISSIONOF THEUNIVERSITY

VISION

To be a globally renowned university, recognized for excellence in teaching, innovative research, and welfare of the society, imbibing the spirit of "Vasudhaivkutumbkam".

MISSION

1. To introduce and implement innovation in teaching and learning process matching up the global standards to strengthen academic delivery through curriculum design, teaching pedagogy and usage of ICT.
2. To develop a mechanism that attracts talented, qualified and experienced faculty from across the globe for pursuing their academic and research careers at the University.
3. To offer academic programs at UG, PG, doctoral, Post-Doctoral levels which are learner-centric, industry focused, and adhere to outcome based international models.
4. To create an ambiance that is conducive for undertaking sponsored research, innovation and consultancy services to a wide spectrum of societal and industrial requirements while encouraging interdisciplinary approach of learning, team work, and research.
5. To establish state of art centers of excellence in frontier areas of research and design innovation through industry collaboration to innovate and incubate the products and services.
6. To establish smart campus and promote e-governance activities in the university for the digitally empowered society and knowledge economy.
7. To provide a hygienic, modern, environment friendly and vivacious campus attuned to the urgent needs of Green Technology.
8. To consider and implement norms, metrics, standards, procedures and benchmarks for assessing and improving the quality in every aspect of University system and achieve quality certifications by National and International bodies.
9. To make society self-reliant by organizing various programmes including literacy, gender sensitization, health awareness, and dissemination of information about livelihood generation.

VISION AND MISSION OF THE DEPARTMENT

VISION

To train students to be highly effective instructors, researchers,developers and contributors to IT companies globally. Be regarded as a prestigious centre of scholarly achievement worldwide.

MISSION

1. To foster advance research and best education in IT domain.
2. To create skilled employees for businesses and industries based on latest IT technologies like artificial intelligence, data science and IoT etc.
3. To offer learning environment that is centered on the needs of the students in order to help in their overalldevelopment.

Background

1. **CBCS andLOCFanintegratedApproach**

   Considering the curricular reforms as instrumental for desired learning outcomes, theacademic departments of Indira Gandhi University Meerpur, Rewari, Haryana made a rigorous attempt to revisethe curriculum of postgraduate programmes in alignment with UGC Quality Mandate for Higher Education Institutions-2021.

   The revised curricula of various programmes could be devised with concerted efforts of the faculty and Heads of the Departments\.The draft prepared by each department was discussed in series of discussion sessions conducted at Department, and the University level. The leadership of the University has been a driving force behind the entire exercise of developing the uniform template and structure for the revised curriculum. The Vice Chancellor of the University conducted series of meetings with Head sand Deans to deliberate upon the vital parameters of the revised curriculum to formulate a uniform template featuring Background, Programme Educational Objectives, Course Outcomes, Programme Specific Outcomes, Structure of Masters Course, Semester-wise Courses and Credit Distribution, Teaching-Learning Process, Assessment and Evaluation, Keywords, References and Appendices. The experts of various Boards of Studies contributed to a large extent in giving the final shape to their vise curriculum of each programme.

To ensure the implementation of curricular reforms envisioned in CBCS-LOCF, the University has decided to implement various provisions in a phased manner.

1.1 About Computer Science & Engineering

"Computer Science & Engineering" is one of the fastest growing area of science and technology at globe. Computer application course is branch of science and engineering (CSE) has a strong connection with to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and in-depth knowledge of the particular application domain.

Computer Applicationscourses are highly sought after by students for their higher education. Computer application courses involve the study of algorithms, data structures, basic and advanced programming with C language, web programming, database management systems, web programming, machine learning, AI, IoT, Cloud computing, Edge Computing, Java basic and advanced, Python Programming, MATLAB and others Emerging Courses. The computer application courses are usually a combination of both theoretical and practical knowledge and are sub-categorized into Operating systems, Office Applications, Professional Software(s), and Network Technologies. In addition to this, they also learn to use and work with tools that help in developing faster as well as better applications. In a nutshell, computer application course details are aimed at providing research-based training so that students can become efficient and professional software developers.

1.2 About the Programme (Nature, Extent and Aims)

The Post-Graduate Programme in CSE will impart advanced knowledge of Computer sciences to the graduates. It will prepare the students for taking up challenging assignments in academia and industry and also empower them with skill and knowledge for generating employment for their own and others. The Programme introduces the students to advanced developments in Computer Science & Applications by providing them latest computer courses and advanced programming along with interdisciplinary skills. The design of choice-based curriculum can enrich students with analytical and problem-solving capabilities. It is designed to bring out the best of the abilities of each

student, allow them to sharpen scientific temper and be well-informed with the contemporary developments in the area.

The programme includes a balanced combination of Core, Discipline centric Electives Courses, Open Elective Courses, Foundation Elective Courses, Summer trainings and Project work to fulfill the aim of NEP-2020. The courses of MCA are designed in such a way to cover the entire spectrum of computer applications from fundamentals (that will bring admitted students from various backgrounds to a common level) to most recent advancements in the field (that will make them ready to take up challenging assignments in the real world).

With the MCA course the student can learn a wide range of specializations- computer architecture, computer graphics, operating system, object-oriented programming, machine learning, cryptography, cloud computing, IoT along with the other major subjects of science. The Learning Outcome-based Curriculum Framework in Computer Science is aimed at allowing flexibility and innovation in design and development of course content, in method of imparting training, in teaching learning process and in assessment procedures of the learning outcomes. The emphasis in computer science courses, in outcome-based curriculum framework, help students learn solving problems, accomplishing IT tasks, and expressing creativity, both individually and collaboratively. The proposed framework will help Students learn programming techniques and the syntax of one or more programming languages.

MCA is a 2-year course that is divided in to 4 semesters in which last semester is for the project training. There is a total of 5 subjects and 3 labs in each semester.

1.3 Possible career prospects

There are enormous career opportunities crop up every day with growth of IT industry. Knowledge of the various computer application areas opens the doors for multiple job opportunities in diverse areas like manufacturing, IT, finance, trading, transportation, software development, healthcare, education as well as research. Increasing

applications of computers in almost all areas of human endeavour has led to vibrant industries with concurrent rapid change in technology.

On successful completion of the MCA Programme, students of the department are expected to be ready to take up opportunities all around the world in areas that demand skills in IT and computing. As the IT industry is enormously vast and diverse, numerous opportunities and challenges await the postgraduates. The postgraduates are expected to satisfactorily address the professional expectations, maintain a work-life balance and lead productive and meaningful lives. Some of the possible career paths for the postgraduate students may be:

- Teaching and Research in academia
- Software developer in IT industries and MNCs
- Entrepreneurship by setting up own company.
- Research scientists in government as well as private organizations.
- Administrative Assignments in various government and private agencies/ organizations
- Technical experts and programmer.
- Different jobs at various levels and departments of numerous industries like HR, Finance, marketing, maintenance etc.

Programme Outcomes (PO), MCA, Department of CSE, Indira Gandhi University, Meerpur, Rewari

PO1	Knowledge	Capable of demonstrating comprehensive disciplinary knowledge gained during course of study.
PO2	Research Aptitude	Capability to ask relevant/ appropriate questions for identifying, formulating and analyzing the research problems and to draw conclusion from the analysis.
PO3	Communication	Ability to communicate effectively on general and scientific topics with the scientific community and with society at large.
PO4	Problem Solving	Capability of applying knowledge to solve scientific and other problems.
PO5	Individual and Team Work	Capable to learn and work effectively as an individual, and as a member or leader in diverse teams, multidisciplinary settings.
PO6	Investigation of Problems	Ability of critical thinking, analytical reasoning and research based knowledge including design of experiments, analysis and interpretation of data to provide conclusions.
PO7	Modern Tool usage	Ability to use and learn techniques, skills and modern tools for scientific practices.
PO8	Science and Society	Ability to apply reasoning to assess the different issues related to society and the consequent responsibilities relevant to the professional scientific practices.
PO9	Life-Long Learning	Aptitude to apply knowledge and skills that are necessary for participating in learning activities throughout life.
PO10	Ethics	Capability to identify and apply ethical issues related to one’s work; avoid unethical behaviour such as fabrication of data, committing plagiarism and unbiased truthful actions in all aspects of work.
PO11	Project Management	Ability to demonstrate knowledge and understanding of the latest IT technologies and apply these to manage projects.

Programme Educational Objectives (PEOs):

The Department of CSE has formulated the Programme Educational Objectives (PEO's) with those in fields. The Programme educational objectives (PEO) are the statement that describes the career and professional achievement after receiving the degree. The PEO's of the Master's degree in Computer Applications are as follows:

PEO1: To have fundamental as well as advanced knowledge of the Information Technologies.

PEO2: To provide the professional services to IT industries, Research organization, in the domain of super specialization.

PEO3: To opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.

Programme Specific Outcomes (PSO's):

The Programme outcomes (PSO) are the statement of competencies/ abilities. PSOs are the statement that describes the knowledge and the abilities the post-graduate will have by the end of Programme studies.

PSO1: The detailed functional knowledge of theoretical concepts and experimental aspects of computer science.

PSO2: To integrate the gained knowledge with various contemporary and evolving areas in computer sciences like Artificial Intelligence, Machine Learning, and Data Science etc.

PSO3: To understand, analyze, plan and implement qualitative as well as quantitative problems in computer science.

PSO4: Provide opportunities to excel in academics, research or Industry.

Mapping of PEO's with PO's and PSO's

S. No.	*Programme Educational Objectives*	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
1	To have fundamental as well as advanced knowledge of IT.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	To provide the professional services to industries, Research organization, in the domain of super specialization.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	To opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

General objectives of the course

The broad objective of the MCA programme is to prepare post graduates for productive careers in software industry, corporate sector, Govt. organizations and academia by providing skill based environment for teaching and research in the core and emerging areas of the discipline. The Programme's thrust is on giving the students a thorough and sound background in theoretical and skill-oriented courses relevant to the latest computer software development. The programme emphasizes the application of software technology to solve mathematical, computing, communications/networking and commercial problems. This Master's Degree Programme has been designed with a semester approach in mind.

The first year courses are aimed at skills development in computers using various technologies and focused on core courses providing conceptual frame work and the second year provides the specialization and the project work.

1. Produce knowledgeable and skilled human resources which are employable in IT and ITES.
2. Impart knowledge required for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application.
3. Produce entrepreneurs who can develop customized solutions for small to large Enterprises.
4. To develop academically competent and professionally motivated personnel, equipped with objective, critical thinking, right moral and ethical values that compassionately foster the scientific temper with a sense of social responsibility.
5. To develop students to become globally competent.
6. To inculcate Entrepreneurial skills among students

Expected Programme Outcomes

The **Master of Computer Applications (MCA)** Programme will prepare its graduates to achieve:

1. The understanding to apply knowledge of computing and technological advances appropriate to the programme.
2. Skills to analyze a problem, and identify and define the logical modeling of solutions.
3. An ability to design implements and evaluate a computer-based system, process, component, or programme to meet stakeholder needs.
4. The knack to function effectively in teams to accomplish a common goal.
5. A sense of professional, ethical, legal, security and social issues and responsibilities.
6. Effectiveness in communicating with a wide range of audiences.
7. An ability to analyze the local and global impact of business solutions on individuals, organizations, and society.
8. An identification of the need to engage in continuing professional development.

INDIRA GANDHI UNIVERSITY, MEERPUR, REWARI

SYNOPSIS OF

SCHEME OF STUDIES & EXAMINATIONS

2 YEARS MCA SEMESTER I-IV (2022-2023)

Total Credits: 107 + 4 to 6 credits (MOOC/NPTEL) Total

Theory Subjects: 15

Total Labs excluding Seminars, Projects and MOOC/NPTEL course: 08

Industrial Training: 1 (one complete semester)

Total Teaching Schedule:

Lectures	Tutorials	Practical	Total
65	**0**	**36(32+4)**	**101**

Total Marks:

Sessional	End Term	Total
850	**1700+100 (Audit Course)**	**3000+100 (Audit Course)**

Itemized Break-up:

	No.	Hours in week	Marks	Credits	Total Theory and labs etc.
Theory Subjects	**15**	**4 or 5**	**1500**	**65**	**65**
Labs	**08**	**4**	**800**	**16**	**32 +4 (project)**
Seminar	**3**	**-**	**75**	**3**	
Self-study paper	**3**	**-**	**75**	**3**	
Projects	**1**	**4**	**50**	**4**	
IndustrialTraining	**1**	**24**	**500**	**12**	
MOOC/NPTEL/ONLINE	**2**	**4**	**-**	**4 to 6**	
Audit Course	**1**	**4**	**100**	**2**	
Foundation Elective	**1**			**2**	
Total			**3100**	**107 + 4 to 6**	

CHOICE BASED CREDIT SYSTEM SCHEME

Program Core Courses (PCC)			
Sr. No.	**Name the Subject**	**No. of Lectures / Tutorial**	**No. of Credits**
1	Object Oriented Programming with Java	5	5
2	Modern Operating System with UNIX	5	5
3	Computer Networks	5	5
4	Computer Graphics & Multimedia	4	4
5	Software Engineering & Testing	4	4
6	Data Structures and Algorithms	5	5
7	Database Design Concepts	4	4
8	Theory of Computation	5	5
9	Elective-I	4	4
10	Elective-II	4	4
11	Data Mining andwarehouse	4	4
12	Machine Learning & Data Analytics using Python	4	4
13	Soft Computing	4	4
14	Elective -III	4	4
15	Elective-IV	4	4
Total Credits			65

Skill Enhancement Courses (SEC) : Labs			
Sr. No.	**Name the Lab**	**No. of contact hours**	**No. of Credits**
1	Software Lab-1 (Java ProgrammingLab)	4	2
2	Software Lab-2 (CG Lab)	4	2
3	Software Lab-3 (UNIX Lab)	4	2
4	Software Lab-4 (Data Structures Lab)	4	2
5	Software Lab-5 (Database Lab)	4	2
6	Software Lab-6 (Advance Java lab)	4	2
7	Software Lab-7 (Python Lab)	4	2
8	Software Lab-8 (Web Technology Lab)	4	2
Total credits			16

List of Elective Papers

Elective Papers are being offered depending upon the availability of expertise and the required infrastructure determinedby the University, any one of the following subjects (minimum 10 students are required for any elective subject.)

Elective-I	**Elective-II**
1. Cloud Computing 2. Analysis & Design of Algorithms 3. Mobile computing 4. Cyber Security	1. Artificial Intelligence 2. Network Security & Cryptography 3. Edge and Fog Computing 4. Blockchain Technology and Quantum Computing
Elective-III	**Elective-IV**
1. Internet of Things (IoT) 2. Android Mobile App Development 3. Natural Language Processing 4. Digital Marketing	1. .NET Programming with C# 2. R Programming 3. NOSQL 4. PHP

Skill Enhancement Course (SEC) : Projects

Sr. No.	**Name the Lab**	**No. of contact hours**	**No. of Credits**
1	Minor Project (semester III)	4	4
2	Major Project (Industrial training)	6 (2 Hours per Batch)	12

One MOOC/NPTEL/Online subject to be qualified in 4th semester of MCA

Paper Code	**Course**	**Course Requirements (Hrs.)**	**Credits**	**Total**	**Course Type**
--------	MOOC/NPTEL/Online*	4	**4 to 6**		

*** The MOOC/NPTEL/Online subject can be qualified in Semester 4th during the duration of the Programme through SWAYAM platform (UGC) and the duration of the course should be equal or more than 12 weeks.**

Mandatory Audit Course (MAC) (Mandatory to Qualify)			
Sr. No	**Code**	**Name the Subject**	**No. of contact hours**
1.	BOT-312	Plant Resource Utilization	2
2.	MCA-2311	Introduction to Computer	2
3.	ECO-321	Issues in Indian Economy	2
4	EVS- 307- OEC	Hydrology and Water Resources	2
5	MBA – 330	Basics of Management	2
6	PHY-	Sources of Energy-2	2
7	ENG-XX	Communication Skills-II	2
8	GEOG-301-OEC	Fundamentals of Geography	2
9	OEPY-17	Foundation of Yoga	2
10	MCOEC-1	Tax Planning for Individual	2

Note: For MOOC and Audit courses the central policy of the University will be followed and accordingly the credit will be transferred for MOOC course

Indira Gandhi University, Meerpur, Rewari
Master of Computer Applications (MCA) Regular Programme
Syllabus and Scheme of Examination (CBCS)
w.e.f. 2020-21

A Bridge course (qualifying in nature) of duration 2-3 weeks will be given to students of non IT background before the commencement of first year/semester classes.

Course Name	**Hours**
1. MCA-BC1-Foundation Programming language	20
2. MCA-BC2-Foundation for Mathematics and Architecture	10+10
3. MCA-BC3-Programming Language Lab	
4. Evaluation after Bridge Course	**Two (3 Hours) Theory of 100 marks**
	One (3 Hours) Lab of 50 marks

Note: A student has to take 40% marks to clear the bridge course. Its credit will not be added in the final mark sheet. A student has to compulsorily clear the bridge course to get the degree of MCA.

MCA First Year

Semester-I

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
MCA-2101	Object Oriented Programming with Java	5:0:0	5	80	20	100
MCA-2102	Modern Operating System with UNIX	5:0:0	5	80	20	100
MCA-2103	Computer Networks	5:0:0	5	80	20	100
MCA-2104	Computer Graphics &Multimedia	4:0:0	4	80	20	100
MCA-2105	Software Engineering & Testing	4:0:0	4	80	20	100
MCA-2106	Software Lab-1 Java Programming Lab	0:0:4	2	80	20	100
MCA-2107	Software Lab-2 CG Lab	0:0:4	2	80	20	100
MCA-2108	Software Lab-3 Unix Lab	0:0:4	2	80	20	100
MCA-2109	Seminar	-	1	-	-	25
MCA-2110	Self Study Paper	-	1	-	-	25
			31	**640**	**160**	**850**

*Practical Examination of MCA-2106, 2107 & 2108 may be conducted on the same day in 2 sittings each maximum of 4 hours.

MCA First Year

Semester-II

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
MCA-2201	Data Structures and Algorithms	5:0:0	5	80	20	100
MCA-2202	Database Design Concepts	4:0:0	4	80	20	100
MCA-2203	Theory of Computation	5:0:0	5	80	20	100
MCA-2204	Elective-I	4:0:0	4	80	20	100
MCA-2205	Elective-II	4:0:0	4	80	20	100
MCA-2206	Software Lab-4 Data Structures Lab	0:0:4	2	80	20	100
MCA-2207	Software Lab-5 Database Lab	0:0:4	2	80	20	100
MCA-2208	Software Lab-6 Advance Java lab	0:0:4	2	80	20	100
MCA-2209	Seminar	-	1	-	-	25
MCA-2210	Self Study Paper	-	1	-	-	25
	Foundation Elective (FEC)		2			
	Total Credits		**32**	**640**	**160**	**850**

*Practical Examination of MCA-2206, 2207 & 2208 may be conducted on the same day in 2 sittings each maximum of 4 hours.

MCA Second Year

Semester-III

Course No.	Paper	(L:T:P)	Credits	University Exams	Internal Assessment	Total
MCA-2301	Data Mining and warehouse	4:0:0	4	80	20	100
MCA-2302	Machine Learning & Data Analytics using Python	4:0:0	4	80	20	100
MCA-2303	Soft Computing	4:0:0	4	80	20	100
MCA-2304	Elective –III	4:0:0	4	80	20	100
MCA-2305	Elective-IV	4:0:0	4	80	20	100
MCA-2306	Software Lab-7 Python Lab	0:0:4	2	80	20	100
MCA-2307	Software Lab-8 Web Technology Lab	0:0:4	2	80	20	100
MCA-2308	Minor Project with IoT Lab	0:0:4	4	25	25	50
MCA-2309	Seminar	-	1	-	-	25
MCA-2310	Self-Study Paper	-	1	-	-	25
	Open Elective (To be Chosen from the pool of Open Electives provided by the University)		2			
			32	**585**	**165**	**800**

*Practical Examination of MCA-2306 & 2307 may be conducted on the same day in 2 sittings each maximum of 4 hours.

MCA Second Year

Semester-IV

Paper Code	Course	University Exams	Internal Assessment	Total	Credits
MCA-2401	Elective-V	-	-	-	3
MCA-2402	Elective-VI	-	-	-	3
MCA-2403	Major Project/Dissertation	400	100	500	12
Total Credits					18

Note: For Elective-V & VI course, the students will opt the NPTEL courses/online mode class by the university) and submit the certificate in the University. The credits will be transferred accordingly in their mark sheet by the university.

List of Elective Papers

Elective Papers are being offered depending upon the availability of expertise and the required infrastructure determinedby the University, any one of the following subjects (minimum 10 students are required for any elective subject.)

Elective-I	**Elective-II**
1. Cloud Computing 2. Analysis Design Algorithms 3. Mobile computing 4. Cyber Security	1. Artificial Intelligence 2. Network Security & Cryptography 3. Edge and Fog Computing 4. Blockchain Technology and Quantum Computing
Elective-III	**Elective-IV**
1. Internet of Things (IoT) 2. Android Mobile App Development 3. Natural Language Processing 4. Digital Marketing	1. NET Programming with C# 2. R Programming 3. NOSQL 4. PHP

List of NPTEL Courses

Note: For Elective-V & VI course, the students will opt the NPTEL courses and submit the certificate in the University. The credits will be transferred accordingly in their mark sheet by the university

Elective-V	**Elective-VI**
1. Compiler Design 2. Social Networks 3. Deep Learning 4. Data Analytics Using PYTHON	1. Cryptography and Network Security 2. GPU-Architecture Programming 3. Introduction to Industry 4.0 and IoT 4. Embedded System

General Instructions

Seminar

Max.Marks-25

Students are required to prepare a presentation on any topic, not from syllabus, assigned by the teacher concerned in the department on the theme/topic such as review of research papers/articles published in national or internal journal or any other research based paper in his/her area of interest. Every candidate will have to deliver a seminar of 15-20 minutes duration on the assigned topic. The seminar will be delivered in the presence of students and teachers of the department on any fixed week day of the semester.

The seminar will be evaluated by an internal committee of two internal teachers, constituted by the Chairperson of the Department. The evaluation (internal evaluation only) will be based on the presentation of the student, depth of subject matter of the topic and answer to questions. There will be a Coordinator to be nominated by the Chairperson of the Department among the teachers of the Department.

Distribution of marks will be as follows:

1. Presentation = 10 Marks
2. Relevancy & Depth of subject matter of the topic = 10 Marks
3. Answers to the Questions = 5 Marks

Self-Study Paper

The objective of this course is to create habits of reading books and to develop writing skills in a manner of creativity and originality. The students will select a topic of their interest with consultation with their teachers/In charge/mentors. After selecting a suitable title for the paper, the student will be required to prepare a hand written report about 6-10 pages in his/her own handwriting. The student will be required to submit the report after getting it checked by the concerned teacher and will be asked to resubmit the report after making the required correction (s) if any before the commencement of the examination of that semester. The structure of the paper will include the following:

- Introduction
- Main Body
- Conclusion

The thoughts presented in the paper must be original work of the students. The paper will be evaluated by the panel (one external and one internal examiner) to be appointed by the Chairperson of Department from the prescribed panel of the University.

The evaluation of Self Study paper will be done as given below:

- Evaluation of the paper 15 Marks
- Viva-voce on the paper 10 Marks
- Total 25 Marks

Bridge Course

MCA-BC1-Foundation of Programming Language

Max. Marks: 100
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit-1

Computer Fundamentals: Computer definition, Generation, input/output devices, operating System definition and its type. Software and its type, office: word, power point, excels etc. **Programming concepts using C language:** Work with primitive types and expressions , basic structure of a C Program, standard I/O, Character Set and Tokens, Data Types, Variables and Constants, Operators and Expressions, memory allocation.

Unit -II

Control structure and Array: Control the flow of Program using Conditional statements and Loops, Functions and its type, type of arguments passing in function, Arrays and Strings, Pointers, Pointer to an array, Array of pointers, Pointers and functions, Structures and Union.

Unit -III

Object Oriented Concept: concept of OOPS, Characteristics of OOPS, Inheritance, constructor and its type, destructor, static and const with classes, operator overloading, friend and virtual functions.

Unit-IV

Streams and Files: Streams classes, command line arguments, disk file I/O with streams, file pointers, error handling in file I/O with member function.

Templates and Exceptions: Function templates, Class templates, Exceptions and its type.

Basic Principles of Management: Introduction to principles of management: Planning, organizing, staffing, Budgeting, Controlling. Scope of IT applications in management, and its benefits, socioeconomic environment and information systems and its impact, Strategic role of IT in organizations

References:

1. Computer Fundamentals by P.K.Sinha, BP B Publications.
2. Let us C by Yashwant Kanetkar, BP B Publications.
3. Object Oriented Programming with C++ by E. Balagurusamy, The Mc Graw Hill Companies.

MCA-BC2-Foundation for Mathematics and Architecture

Max. Marks: 100
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Unit-1

Set and its Operation : Set theory ,Sets and their representations; empty set; finite and infinite sets; equal and equivalent sets; subsets; power set; universal set; Venn diagrams; complement of a set operation on sets; applications of sets. Mathematical Logic, Basic Logical connections; Conjunction; Disjunction; Negation; Negation of Compound Statements; Truth tables. Tautologies; Logical Equivalence.

Unit-II

Algebra, Matrix and statistics: Modern algebra Binary Operation; Addition Modulo n; Multiplication modulo n, Matrices and Determinants Definition of a matrix; Operations on matrices; Square Matrix and its inverse; determinants; the inverse of a matrix, basics Statistics Measures of central Tendency; Standard Deviation; Variance.

Unit-III

Digital Logic and Computer Organization: Computer Evolution: Brief history of Computer, Classification of Computer, Structure of a Computer System, Arithmetic Logic Unit, Control Unit, Bus Structure, Von Neumann Architecture, Bootstrapping. **Number Systems:** Decimal, Binary, Octal, Hexadecimal conversion from one to another, Basic Arithmetic Operations: Integer Addition and Subtraction, Signed numbers, Binary Arithmetic, 1"s and 2"s Complement Arithmetic, Fixed and Floating point numbers, Floating point representation.

Unit-IV

Digital Logic: Logic gates, Boolean Algebra, Basic theorem and Properties of Boolean algebra. Basic concepts on Combinational Circuits and Sequential circuits.**Control Unit Design**: Basic Concepts - Instruction execution cycle - sequencing of control signals. **Memory Organization and I/O:** Characteristics of Memory Systems, Main Memory, Types of Random-Access Memory and ROM, Organization, Static and dynamic memories. Understanding Cache Memory and Virtual Memory, Input / Output Organization: Accessing I/O devices – Understanding Programmed I/O, Interrupt I/O and Direct memory access (DMA)

References:

1. Discrete Mathematics & Structures by Satinder Bal Gupta, Laxmi Publications
2. Digital Electronics by A.P. Godse, Technical Publications.
3. Computer Fundamentals by P.K.Sinha, BP B Publications.
4. Computer System Architecture by M. Morris Mano, Pearson Publications.
5. Any other book(s) covering the contents of the paper in more depth.

MCA-BC3: Programming Language Lab

Max. Marks: 50
Time: 3 Hrs.

Practical's based on the course MCA-BC1.

Semester -1

MCA-2101: OBJECT ORIENTED PROGRAMMING WITH JAVA

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The main objective of subject is to make the clear the fundamentals concept of java programming.
2. After studying this subject the student will be able to know install process of the software in system as well as he/ she will able to design the application using this technology.

Unit – I

Introduction: Object-Oriented Languages, History of Java, Creation of Java, Java for the Internet, Byte-code, Features, Object-Oriented Programming in Java. Java Program Structure and Java Class Library, Data Types, Variables, and Operators, Operator Precedence. Selection Statements, Scope of Variable, Iterative Statement. Defining Classes & Methods, Constructors, Creating Objects of a Class, Assigning Object Reference Variables, Variable this, Definingand Using a Class, Automatic Garbage Collection.

Arrays and Strings: Arrays, Arrays of Characters, String Handling Using String Class, Operations on String Handling Using, String Buffer Class.

Unit – II

Extending Classes and Inheritance: Using Existing Classes, Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Abstraction through Abstract Classes, Final Modifier, Universal Super class- Object Class

Packages & Interfaces: Define Package, type of package, class path, standard packages, Access Protection in Packages, Concept of Interface.

Exception Handling: Concept of Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining your own Exceptions.

Multithreading Programming: Java Thread Model, Define Threads, Main Thread, Creating a new Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks Inter thread communication, Deadlocks

Unit – III

Input/output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console Input Writing Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.

Creating Applets in Java: Applet Basics, Architecture, Life Cycle, Display Methods, Requesting Repainting, Status Window, The HTML APPLET Tag Passing Parameters to Applets.

Working with Windows: AWT Classes, Window Fundamentals, Working with Frame, Creating Frame Window in an Applet, Displaying Information within a Window.

Working with Graphics and Texts: Working with Graphics, Color and Font, Paint Mode Setting, Managing Text Output using Font Metrics, Exploring Text and Graphics. Working with AWT Controls, Layout Managers and Menus.

Unit – IV

Introduction to Servelets: Lifecycle of a Serverlet, JSDK, Servelet API, javax.servelet Package, Reading Servelet parameters, Initialization parameters. javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies- Session Tracking, Security Issues.

Introduction to JSP, Problem with Servelet, Anatomy of JSP page, JSP Processing, JSP Application Design with MVC, Setting Up and JSP Environment:, Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

Course Outcomes:

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.

CO3: Validate input in a Java program.

CO4: Identify and fix defects and common security issues in code.

CO5: Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.

CO6: Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

Mapping of Paper MCA-2101

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

S = Strong, M = Medium, W = Weak

References:

1. The Complete Reference JAVA, TMH Publication.
2. Beginning JAVA, Ivor Horton, WROX Public.
3. JAVA 2 UNLEASHED, Tech Media Publications.
4. JAVA 2(1.3) API Documentations.
5. Any other book(s) covering the contents of the paper in more depth.

MCA-2102: MODREN OPERATING SYSTEM WITH UNIX

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The main objective of the subject to provide knowledge to the student about the working of the different type operating system as well as student can understand the functionality of input and output device interaction with the system.
2. After studying this subject also able to know the use of memory and file with the process management

Unit - I

Introduction of Windows and UNIX operating system: Basic feature of Operating System; Process and CPU Scheduling, Multithreaded Programming, Scheduling Criteria, Multiple Processor Scheduling, Real-Time Scheduling. File Structure; Memory Management: Swapping,
Demand paging, Virtual Memory, Critical Section Problem, Mutual Exclusion Problem.

Unit – II

Introduction of Deadlock, methods of handling, Prevention and Avoidance, Deadlock Detection, Recovery from Deadlock, Disk Scheduling.
Commands: User Names and Groups, Logging in; Format of UNIX commands; Changing your password; Characters with Special Meaning; Files and Directories; Current directory, Directory contents, Absolute and Relative Pathnames, File contents; File access Permissions; Basic operation on Files; Changing Permission Modes; Standard files, Standard output; Standard Input, Standard Error.

Unit - III

Filter and pipelines, Text Manipulation: Inspecting Files; File Statistics, Searching for Patterns; Comparing Files; Operations on File; Printing Files, Rearranging Files; Splitting Files; translating characters; calculator command, nice command, Processes: Finding out about Process; Stopping Background Process. File System; Block and Fragments, I-nodes, Directory Structure; User to User Communication. UNIX Editor vi.

Unit - IV

Shell Programming: Programming in the Borne Shell, C-Shell and Korn-Shell; Wild cards; shell programming; Shell variables; interactive shell scripts; AWK utility.

System Administration: Definition; Booting system; Maintaining user accounts; File systems and special files; Backups and restoration; Role and functions of a system manager, Overview of Linux operating system, Difference between LINUX and UNIX.

Course Outcomes:

CO1: Understand Operating System concepts
CO2:Use System calls and memory management
CO3: Use UNIX commands and editors
CO4: Carry out Unix File management and shell programming in UNIX
CO5: Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
CO6: Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.

Mapping of Paper MCA-2102

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	M	S	S	S	M
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Silberschatz& Galvin: Operating System Concept, Wiley, Latest Edition.
2. YashawantKanetkar: Unix Shell Programming, BPB.
3. Sumitabha Das : UNIX Concepts and Application – Featuring SCO UNIX and LINUX 2nd TMH
4. William Stallings: Operating Systems, PHI, Latest Edition.
5. Maurice Bach : Design of the UNIX Operating System Prentice

MCA-2103: COMPUTER NETWORKS

Max Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Aim of this course is to discuss and explain about basics of data communication and networking concepts.
2. After studying the subject student will be able to understand the working of different types of protocol of networking and model such as OSI reference model, CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing etc.

Unit – I

Data Communication: Introduction of data communication; analog and digital signals; asynchronous and synchronous transmission; Data Encoding and Modulation Techniques, Broadband and Base band transmission; Pulse Code Modulation, bandwidth, channel, baud rate of transmission; Multiplexing; Transmission Medium; transmission errors - error detection and correction.

Unit – II

Network Classification: PAN, LAN, MAN, WAN and wireless network; Network Topology; Network Modes; internet, intranet and Extranet; X.25, frame relay, narrow band and broad band ISDN, ATM.
Network Reference Models: Layered architectures, protocol hierarchies, interface and services: ISO- OSI reference model, TCP/IP reference model; internet protocol stacks.

Unit – III

Data Link Layer Functions and Protocols: Framing, Error-control, Flow-control; sliding window protocol; HDLC; Shortest Path Algorithm, Flooding, Hierarchical Routing, Link State and Distance Vector Routing
Medium Access Sub layer: CSMA/CD Protocol, switched and fast Ethernet, Token Bus, Token Ring, FDDI, IEEE standards for LAN and MAN; satellite networks.

Unit – IV

Network functions and protocols: Switching Concept; cell switching, routing and congestion control, TCP/IP protocol architecture. Network Device: Repeater, hub, switch, router and gateway; IRC; TCP and UDP.

Network Applications: File transfer protocol, E- mail, World Wide Web, Client-Server Environment, DNS.

Course Outcomes:

CO1: Recognize and Describe about the working of Computer Networks.
CO2: Illustrate reference models with layers, protocols and interfaces.
CO3: Summarize functionalities of different Layers
CO4: Combine and distinguish functionalities of different Layers.

CO5: Model the LAN and WAN configuration using different media.
CO6: Examine problems of a computer networks.

Mapping of Paper No. MCA-2103

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	M	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. A.S. Tanenbaum: Computer Networks (4th ed.), Prentice-Hall of India.
2. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
3. P.C. Gupta: Data Communications and Computer Networks, Prentice-Hall of India.
4. Behrouz Forouzan and S.C. Fegan: Data Communications and Networking, McGraw Hill.
5. L. L. Peterson and B. S. Davie: Computer Networks: A Systems Approach, Morgan Kaufmann.
6. William Stallings: Data and Computer Communications, Pearson Education.

MCA-2104: COMPUTER GRAPHICS AND MULTIMEDIA

Max. Marks: 80
Times: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

.

Learning Objectives:

1. Subject will help to understanding the core concepts of Computer Graphics. Student will be able to work on scan conversion, 2D, 3D – transformation and viewing and will be able to create interactive computer Graphics with understanding of shading.
2. This subject also helps to develop software in the Computer Graphics and Multimedia fields of increasing size and complexity across different application areas.

Unit – I

An Introduction Graphics System: Computer Graphics and Its Types, Applications of computer graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input Devices, Hard Copy Devices, Graphics Software.

Output Primitives and Attributes of Output Primitives: Output Primitives Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Inside-Outside tests, Boundary-Fill Algorithm, Flood Fill Algorithm, Cell Array, Character Generation, Anti-aliasing.

Unit – II

Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing

Two-Dimension Viewing: The viewing Pipeline, Window to view port coordinates transformation, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Three– Dimensional Concepts: Three Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

Unit – III

Curves and Surfaces: Bezier Curves, Conditions for smoothly joining curve segments, Bezierbi-cubic surface patch, B-Spline Curves, Cubic BSpline curves using uniform knot vectors, testing for first and second order continuities

Shading and Hidden Surface Removal: Shading, Illumination Model for diffused Reflection, Curved Surfaces, Gourard Shading, Phong Model, Hidden Surface Removal, Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method, Scan Line Method, BSP-Tree Method.

Unit – IV

Multimedia: Introduction to Multimedia: Classification of Multimedia, Multimedia Software, MIDI, Components of Multimedia – Audio: Analog to Digital conversion, Audio play backing and recording Video, Text: Hyper text, Hyper media and Hyper Graphics, Graphics and Animation: Classification of Animation, process of animation, Authoring Process and Tools.

Course Outcomes:

CO1: Have a basic understanding of the core concepts of computer graphics.
CO2: Be capable of using OpenGL to create interactive computer graphics.
CO3: Understand a typical graphics pipeline.
CO4: Have made pictures with their computer.
CO5: Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
CO6: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

Mapping of Paper No. MCA-2104

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Donald Hearn and M.Pauline Baker: Computer Graphics, PHI Publications
2. Plastock : Theory & Problem of Computer Graphics, Schaum Series.
3. Foley & Van Dam: Fundamentals of Interactive Computer Graphics, Addison-Wesley.
4. Newman : Principles of Interactive Computer Graphics, McGraw Hill.
5. Tosijasu, L.K. : Computer Graphics, Springer-verleg.
6. S Gokul: Multimedia Magic, BPB Publication.
7. Bufford: Multimedia Systems, Addison Wesley.
8. Jeffcoate : Multimedia in Practice, Pretice-Hall.
9. Any other book(s) covering the contents of the paper in more depth.

MCA-2105: SOFTWARE ENGINEERING & TESTING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. This course will enhance technical skill of students for employment in industry, government, or entrepreneurial endeavors to demonstrate professional advancement through significant technical achievements and also expanded leadership responsibility.
2. Demonstrate the ability to work effectively as a team member and/or leader in an ever changing professional environment.

Unit – I

Software Engineering Paradigms: Software Characteristics, Software myths, Software Application, Software Process Models, Process iteration, Process activities, CASE Tools. Software Project management: Management activities, Project planning, Project scheduling, Risk management and activities. Software Requirements engineering: Requirements Engineering Process, Phase, Type of software Requirements, Software Requirements specification Document, Specification languages.

Unit – II

Software Metrics and Measures: Process Metrics, Project metrics, Software Project Estimation Models: Empirical, Putnam, COCOMO models. Software Design Process, Principles of software design, Design Strategies, Levels of Software Design, Interface Design, Coding and Software Reuse. Software Testing, Testability and features of Test cases, Software Reliability, Software Safety, Defect testing, Debugging Tools, Software Testing techniques; WBT, BBT, Ticking Box testing; static analysis, symbolic testing, program mutation testing, input space , partitioning, functional program testing, data flow guided testing.

Unit – III

Software Testing Strategies: Approach, Issues; integration, incremental, System, alpha, Beta testing etc; Comparative evaluation of techniques: Testing tools; Dynamic analysis tools, test data generators, Debuggers, test drivers etc. Technical Metrics for Software: Quality Factors, framework; Metrics for analysis, design, testing source code etc. Object Oriented Testing: OOT strategies and issues, Test Case design, interface testing.

Unit – IV

Software Maintenance and its types, S/w Configuration Management, S/w Reuse, Software Evolution, Software Quality Assurance: – plans & activities, concept, importance and essence; FTR, structured walk through technique etc., Software Documentation, Software Reliability, validation, Software Safety and Hazards Analysis; Features affecting software quality, SQA Plan, Using project management software tools, Quality management, issue, standards and methods, ISO Quality models: ISO 9000 and SEI-CMM and their relevance.

Course Outcomes:

CO1: Ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

CO2: Ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, aswell as global, cultural, social, environmental, and economic factors

CO3: Ability to communicate effectively with a range of audiences

CO4: Discuss about the functional and system testing methods.

CO5: Demonstrate various issues for object oriented testing.

CO6: Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Mapping of Paper No. MCA-2105

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Pressman: Software Engineering, TMH.
2. Gill N.S. : Software Engineering, Khanna Book Publishing Co.(P) Ltd, N. Delhi. 3. Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications. 4. Meyers, G.: The art of Software Testing, Wiley-Inter-Science.
5. ChhillarRajender Singh: Software Engineering: Testing, Faults, Metrics, Excel Books, New Delhi.
6. Deutsch, Willis: Software Quality Engineering: A Total Technical and Management Approach, Prentice Hall.

MCA-2201: DATA STRUCTURES & ALGORITHMS

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The main objective of subject understands about algorithms writing and the fundamental approach of data structures to solving problems.
2. It helps to understand concepts about searching and sorting techniques as well as other data structure technique which are used to solve the particular problem using the basic concepts such as stacks, queues, lists, trees and graphs.

Unit – I

Definition, Classification of data structures, Operations on data structures, Design and analysis of algorithm, Top down and bottom up approaches to Algorithm design, Frequency count, Complexity, Arrays: Address calculation using column and row major ordering, Various operations on Arrays, Vectors, Application of arrays: Matrix multiplication, sparse polynomial representation and addition.

Unit – II

Stacks and Queues: Introduction, Operations, Representation using arrays and linked-list, Circular queues, Priority Queue and DeQueue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks. Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, doubly linked lists.

Unit-III

Binary tree traversal methods: Preorder, In-order, Post-ordered. Recursive Algorithms, Traversal methods, Binary tree representation of a general tree, Conversion of forest into tree, Threaded binary trees. Binary search tree: Height balanced (AVL) tree, B-trees. Sorting: Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort, Heap sort, Radix sort and their complexities.

Unit-IV

Searching, sorting and complexity, Hashing Schemes. Comparison of time complexity. Graph representation: Adjacency matrix, Adjacency lists, Depth first search, Breadth first search. Spanning tree: Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prim's and Kruskal's). File Structures: File Organization, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

Course Outcomes:

CO1: Ability to analyze algorithms and algorithm correctness.
CO2: Ability to summarize searching and sorting techniques.
CO3: Ability to describe stack, queue and linked list operation.
CO4: Ability to have knowledge of tree and graphs concepts.
CO5: Describe the hash function and concepts of collision and its resolution methods
CO6: Solve problem involving graphs, trees and heaps.

Mapping of Paper No. MCA-2201

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Hubbard JR: Schaum‟s outline of Data Structures with C++, TMH.
2. R. Sedgewick: Algorithms in C++, Pearson Education Asia.
3. Y.Langsam, M.J.Augenstein and A.M.Tanenbaum: Data Structures Using C and C++, Prentice Hall of India.
4. R.Kruse, C.L.Tonodo and B.Leung: Data Structures and Program Design in C, Pearson Education.
5. S.Chottopadhyay, D.Ghoshdastidar&M.Chottopadhyay: Data Structures Through „C‟ Language, BPB Publication.
6. G.L. Heileman: Data Structutes, Algorithms and Object Oriented Programming, Tata McGraw Hill.
7. E. Horowitz, Sahni and D. Mehta: Fundamentals of Data Structures in C++, GalgotiaPubliction.

MCA-2202: DATA BASE DESIGNING CONCEPTS

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks

Learning Objectives:

1. Database Management Systemsprovides an introduction to the students about management of database systems.
2. This course will emphasize on the understanding of the fundamentals of relational systems including data models, architectures, and manipulations.
3. It will also cover an understanding of new developments trends such as Internet database environment and data warehousing as well as a problem-based approach to learning.

Unit-I

Introduction to Database, features, Applications, data base System Vs. File Processing System, Instances and Schemas. Data Models – Hierarchical, Network, Relational Model. Database Access for applications Programs – data base Users and Administrator, Data Independence, Data base System Architecture. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model, and Conceptual Design for Large enterprises.

Unit-II

Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views, Destroying /altering Tables and Views. Relational Algebra and Calculus: Relational Algebra, Selection and projection set operations, renaming, Joins, Division, Examples of Algebra overviews, Query Processor, Codd's 12 Rules. Relational calculus–Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.

Unit-III

Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries Set, Comparison Operators, NULL values, Comparison using Null values, Logical connectivity's – AND, OR and NOT. Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases. Database Languages – DDL, DML, DCL and Its commands. Schema refinement, Problems Caused by redundancy, Decompositions, Problem related to decomposition, Normalization: FIRST to FIFTH Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Data base Design, Multi valued Dependencies.

Unit-IV

Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Lock Based Concurrency Control, Performance Locking, Introduction to Crash recovery. Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques.

Course Outcomes:

CO1: To introduce the concept of Data Abstraction & Data Independence.
CO2: To describe the factors various Data base Models.
CO3: To apply the concept of Relational query Languages.
CO4: To impart knowledge of Query Processing optimization with the help of Algorithms.
CO5:To know about the storage strategies including Hashing.
CO6:To instruct about the Transaction Processing.

Mapping of Paper No. MCA-2202

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Silberschatz, Korth: Data base System Concepts, McGraw Hill, latest edition.
2. P. Radha Krishna: Database Management Systems, HI-TECH Publications.
3. C.J.Date: Introduction to Database Systems, Pearson Education.
4. Gupta,S.B., Aditya Mittal, Introduction to Data base Management System, University Science Press, New Delhi.
5. ElmasriNavrate: Data base Management System, Pearson Education.

MCA– 2203 THEORY OF COMPUTATION

Max. Marks: 80

Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. This subject is the base of the computer machine and the objective is to clear the concept of students regarding the designing and the working of the machine and computer system.
2. After studying this subject students are able to interpret the function of system as well as able to design new machine for the automation of system.

Unit-1

Finite State Systems, Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA, Conversion of NFA to DFA , minimization of finite automata, Finite automata with ϵ- moves, Acceptability of a string by a finite Automata.

Introduction to Machines: Properties and limitations of Finite Automata, Mealy and Moore Machines, Conversion of Mealy to Moore machines and vice versa.

Unit-II

Regular Expression: State and prove Arden‟s Method, Regular Expressions, Recursive definition of regular expression, Regular expression conversion to Finite Automata and vice versa. Kleene Closure.

Properties of regular languages: Regular language, pumping lemma for regular sets/languages, Application of regular languages.

Unit-III

Grammars: Chomsky hierarchy of languages, Relation between different types of grammars, Context-free grammar, Derivation tree / Parse tree, Ambiguity in regular grammar and their removal, Reduced Forms: Removal of useless symbols, null and unit productions, Normal Form: Chomsky Normal form(CNF) and Greibach Normal Form(GNF).

Push Down Automata: Introduction to PDA, Deterministic and Non-Deterministic PDA, Design of PDA: Transition table, Transition diagram and acceptability of strings by designed PDA, Pushdown automata (PDA) and equivalence with CFG.

Unit-IV

Turing machines: The basic model for Turing machines (TM), Deterministic and Non Deterministic Turing machines and their equivalence, Design of Turing Machines: Transition table, Transition diagram and acceptability of strings by designed Turing machine. Variants of TM, Halting problem of TM, PCP Problem of Turing Machine, Linear Bounded Automata, TMs as enumerators. Universal Turing machine, reduction between languages, undecidable problems about languages. Primitive Recursive Functions, Total Recursive Functions.

Course Outcomes:

CO1: Model, compare and analyses different computational models using combinatorial methods.
CO2: Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata.
CO3: To solve various problems of applying normal form techniques, push down automata and Turing Machines.
CO4: Identify limitations of some computational models and possible methods of proving them.
CO5: Overview of how the theoretical study in this course is applicable to and engineering application like designing the compilers.
CO6: Demonstrate advanced knowledge of formal computation and its relationship to languages.

Mapping of Paper No. MCA-2203

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Introduction to automata theory, language & computations-Hopcroaft& O.D. Ullman, R.Mothwani, 2001, A.W.
2. Theory of Computer Sc. (Automata, Langugaes and computations): K.L.P. Mishra &N.Chandrasekaran, 2000PHI.
3. Introduction to formal Languages & Automata-PeterLinZ, 2001, Narosa Publ.
4. Fundamentals of the Theory of Computation-Principles and Practice By RamondGreenlaw and H.James Hoover, 1998, Harcourt India Pvt. Ltd.
5. Elements of theory of Computation by H.R.Lewis&C.H.Papaditriou, 1998,PHI.
6. Introduction to languages and the Theory of Computation by John C.Martin 2003, T.M.H.

MCA-2301: DATA WAREHOUSING & MINING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The primary objective of the paper is the introduction of basic concepts of data warehouse, its key features and benefits of studying the paper in era of data science.
2. Understanding design and development of data warehouse, data preprocessing and data analysis using data mining.
3. Introduction of multi-dimensional data analysis and practical implementation of various data mining software/ tools so that as an outcome, student after completing the course can easily apply the different methods for knowledge discovery, can learn advanced analytical methods for their career and easily select research problems as well as solutions using data mining tools.

Unit – I

Introduction data warehouse, Need, definition, goals, Data Mart, Data warehouse architecture, ETL process, star, snowflake and galaxy schemas for multidimensional databases, Designing fact tables. Partitioning.

Unit-II

OLTP vs OLAP technology, multidimensional data models and different OLAP operations, OLAP Server: ROLAP, MOLAP and HOLAP. Data cubes, efficient computation of data cubes, distributed and virtual data warehouse.

Unit-III

Data preprocessing, Data mining primitives, Types of Data Mining, Data Mining query language, Architectures of data mining. Data generation & Summarization based characterization, Mining class comparisons, Mining Association Rules in large databases: Association rule mining, single dimensional Bookan association rules from Transactional DBS, Multi level association rules from transaction DBS, multidimensional association rules. Correlation analysis, Constraint based association mining.

Unit-IV

Classification and Prediction: Classification by decision tree induction, Back propagation, Bayesian classification, classification based in association rules, Prediction, Cluster analysis, partitioning and hierarchical methods, Density based method, web mining, Temporal and spatial data mining. Introduction to Data Mining tools: Rapid Miner, R-Programming, Orange Weka, Oracle BI, Advanced Miner.

Course Outcomes:

CO1: Understand the functionality of the various data mining and data warehousing component.
CO2: Appreciate the strengths and limitations of various data mining and data warehousing models.
CO3: Explain the analyzing techniques of various data.
CO4: Remove redundancy and incomplete data from the dataset using data preprocessing methods.
CO5: Compare different approaches of data ware housing and data mining with various technologies.
CO6: Describe different methodologies used in data mining and data ware housing.

Mapping of Paper No. MCA-2301

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
2. S .Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVTLtd. (Morgan Kaufmann Publishers).
4. Michall Corey, M.Abbey, I Azramson& Ben Taub: Oracle 8i Building Data Ware Housing,TMH.
5. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen).
6. SimaYazdanri&Shirky S. Wong: Data Ware Housing with oracle.
7. A.K. Pujari: Data Mining Techniques, University Press.
8. IBM An Introduction to Building the Data Warehouse, PHI Publication.
9. Pieter AdriaansDolfZantinge: Data Mining, Addition Wesley.
10. David Hand, HeikkiMannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.

MCA-2302: MACHINE LEARNING AND DATA ANALYSIS USING PYTHON

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Understanding the importance of Python in Machine Learning and Data analysis.
2. Getting knowledge of Machine learning algorithms in Python.
3. Develop the Python programming skills to solve computational problems.
4. Make the students aware about the usefulness of various python packages as per the application requirements.

Unit – I

Introduction to Python: History of Python, An interpreted high level language, Need of Python Programming, Applications, Importance in Data Science. **Introduction to Machine Learning:** Definition of Machine Learning; Machine learning and AI, Use/Role of Python in AI, Importance of Python in AI and Machine learning. Applications of Machine Learning, Supervised vs. Unsupervised Learning, Python libraries suitable for Machine Learning; Overview of Python Libraries and Packages: Pillow, Matplotlib, Numpy, NLTK (Natural Language Toolkit), FlashText, Scipy, sklearn, Bokeh, Pandas, Mahotas.Pros& Cons of Machine Learning.

Unit – II

Machine Learning Algorithms in Python: Advantages/Applications of machine learning Algorithms, Regression: Linear Regression, Non-linear Regression; Classification: K-Nearest Neighbour, Naive Bayes, Decision Trees, Logistic Regression, Support Vector Machines, Clustering: K-Means Clustering, Hierarchical Clustering, Density-Based Clustering, Recommender Systems: Content-based recommender systems, Collaborative Filtering; Role of Model evaluation.

Unit - III

Installing and working with Python: Data Types, Operators and Operands in Python, Operator precedence; Expressions and Statements (Assignment statement); Input / Output and Comments in Python; **Data Structures:** Mutable or immutable objects in python; Lists, Tuples, Sets, Dictionaries; **Control structures:** Conditional Branching, Looping, Exception Handling; **User-defined functions:** Defining, invoking functions, passing parameters (default parameter values, keyword arguments), Scope of variables- Global and Local Variables, Void functions and Fruitful Functions. **File Handling:** File handling functions, Object Oriented concepts in Python: Classes in python: Creating a Class, The Self Variable, Constructor, Types of Variables, Namespaces; Inheritance: Types of Inheritance.

Unit - IV

Data Science Using Python: Downloading and reading data files in Python, Data Frame (Creating Data Frame from an Excel Spreadsheet, Creating Data Frame from .csv Files, Creating Data from Python List of Tuples, Operations on Data Frames);**Data Exploration:** head(), tail(), describe(),value_counts(), GroupBy(); **Data Wrangling:** Check missing values in the dataset, Fill missing values, Binning in Python; **Data Visualization:** Bar Graph, Histogram, Creating a Pie Chart, Creating Line Graph.

Course Outcomes

CO1: Exploring the different ways of running Python.

CO2: Teach the students to deal with real world data by importing data and performing various data analysis operations.

CO3: Plotting the data for data visualization.

CO4: How to install python software and IDEs.

CO5: How to use various data types like List, Tuple, and Dictionary etc.

CO6: How to use various loops and conditional statements.

Mapping of Paper No. MCA-2302

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. *Jake VanderPlas:*Python Data Science Handbook.Publisher(s): O'Reilly Media, Inc. 2016.ISBN: 9781491912058.
2. U Dinesh Kumar ManaranjanPradhan:Machine Learning using Python Paperback, Wiley,2019.
3. AbhishekVijayvargia:Machine Learning with Python Language Paperback, BPB Pulications 2018.
4. Kareem Alkaseer:Machine Learning & Big Data.
5. Sebastian Raschka and VahidMirjalili:Python Machine Learning, Packt 2017. packtpub.com
6. Andreas C. Mueller, Sarah Guido:Introduction to Machine Learning with Python Paperback, Kindle Edition, 2017.
7. https://bugs.python.org/file47781/Tutorial_EDIT.pdf
8. https://www.python.org/about/gettingstarted.
9. https://www.tutorialspoint.com/python/index.htm.

MCA-2303: SOFT COMPUTING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logictheory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineeringperspective.

Unit – I

Introduction: soft computing; biological and artificial neural network; fuzzy sets and fuzzy logic systems. Introduction to Genetic Algorithm, Genetic Operators and Parameters, Genetic Algorithms in Problem Solving, Advantages, Limitations and applications of Genetic algorithms.

Unit-II

Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks- Supervised, Unsupervised and Reinforcement learning; Models of ANN- Feed forward and feed backward, Applications of Neural Network.

Unit-III

Fuzzy systems and applications: fuzzy sets; Membership function and its features and its Operations, fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering; applications of fuzzy systems. Neuro-fuzzy systems: neuro-fuzzy control.

Unit-IV

Applications: Pattern Recognitions, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Course Outcomes:

C01: Develop mathematical thinking and problem solving skills associated with research and writing proofs.

CO2: Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.

CO3: Use Graph Theory for solving problems.

CO4: Acquire basic knowledge of sampling and estimation.

CO5: Understand basic concepts of hypothesis.

CO6: Understand the mathematical fundamentals that are prerequisites.

Mapping of Paper No. MCA-2303

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall. 38
2. Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
3. Davis E.Goldberg: Genetic Algorithms: Search, Optimization and Machine Learning,Addison Wesley.
4. S. Rajasekaran and G.A.V.Pai: Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI.
5. D. E. Goldberg: Genetic Algorithms in Search, Optimization, and Machine Learning, Addison.

Open Elective

(Provided by the Dept. of Computer Science & Engineering)

(PAPER: MCA-2311-A) INTRODUCTION TO COMPUTER

Max. Marks: 80.

Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The fundamentals of computing devices and use of computer hardware and software, networking and mobile computing.
2. Provide hands-on use of Microsoft Office 2013 applications Word, Excel, Access and PowerPoint.
3. Provide foundational or "computer literacy" that prepares students for life-long learning of computer concepts and skills.

Unit-I

Basic Concepts: What is computer, Characteristics of a Computer, Advantages of Computer, Limitations of Computer, Types of computer, Applications of computer, Data Representation, Hardware, firmware, Live-ware, Software: Relationship between hardware and software, System software: Operating system, Translators, Interpreter, Compiler, Assemblers, Linkers. Overview of operating system, Functions of operating system.

Unit-II

Information Systems: Meaning, Need of an efficient Information system, Types of Information System. Information requirement for Planning, Coordination, and control for various levels in Business, Industry. Basic of data arrangement and access. Introduction to database: Definition, Uses of databases, characteristics of database, DBMS, data independencies, difference between traditional file processing system and database approaches.

Unit-III

Net works: LAN, WAN. Wireless Network, Introduction networking, Importance of networking, Communication devices such as Modem, Features of Networking, Introduction to Internet: Meaning of Internet, Growth of Internet, Owner of Internet, Anatomy of Internet, Basic Internet Terminology, World Wide Web, Internet Protocols, Usage of Internet to society, Search Engines.

Unit-IV

Introduction to MS Word: Features of MS Word, component of word document window, creating and Printing a document, Formatting text and document, Mail Merge, Macro, Export and Import file, working with auto shapes, Adding pictures to a work document.

Introduction to MS Excel: Features of Excel, Creating a table, Formatting worksheet, Types of graph, Excel functions, Printing a worksheet, Managing and Organizing data,Power point presentation.

Course Outcomes:

CO1: Utilize the Internet Web resources and evaluate on-line e-business system.

CO2: Solve common business problems using appropriate Information Technology applications andsystems.

CO3: Identify categories of programs, system software and applications, Organize and work with files andfolders.

CO4: Describe various types of networks network standards and communication software.

CO5: Identify the basic elements required in a computer system.

CO6: Produce electronic documents using various software applications.

Mapping of Paper No. MCA-2311-A

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Introduction To Computers" by Ms Shikha Nutiyal
2. Introduction to Information Technology" by Rajaraman V
3. Computer Fundamentals" by P K Sinha
4. Computer Fundamentals" by Goel

(PAPER: MCA-2311-B)
PYTHON PROGRAMMING

Max. Marks: 80.
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Understanding the importance of Python in Machine Learning and Data analysis.
2. Getting knowledge of Machine learning algorithms in Python.
3. Develop the Python programming skills to solve computational problems.
4. Make the students aware about the usefulness of various python packages as per theapplication requirements.

Unit-I

Introduction to Python Programming, History of Python, its features, Scope of Python, Downloading and installing Python, Python code execution process, run a simple program on Python interpreter and IDLE. The concept of data types; variables, assignments; numerical types; arithmetic operators and expressions; comments in the program.

Unit-II

Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation, Lists, tuples, and dictionaries; basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

Unit-III

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling, inheritance, polymorphism, operator overloading; exception handling, try block.

Unit-IV

Installing and exploring different python libraries used in Graphical User Interface design, Basics of File handling in python, Introduction to Matplotlib.

Course Outcomes

CO1: Exploring the different ways of running Python.

CO2: Teach the students to deal with real world data by importing data and performing various data analysis operations.

CO3: Plotting the data for data visualization.

CO4: Able to understand the Design and analyse small signal amplifier circuits

CO5: Ability to understand Postulates of Boolean algebra and to minimize combinational functions

CO6: Ability to understand Design and analyze combinational and sequential circuits.

Mapping of Paper No. MCA-2311-B

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Fundamentals of Python: First Programs Author: Kenneth Lambert Publisher: Course Technology, Cengage Learning, 2012 ISBN-13:978-1-111-82270-5
2. Michael Urbanand Joel Murach, Python Programming, Shroff /Murach,2016
3. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010
4. Sheetal Taneja & Naveen Kumar, Python Programming - A Modular Approach with Graphics, Database, Mobile and Web Applications, Based on Python 3.

PAPER MCA-2312 COMPUTER AND NETWORK SECURITY

Max. Marks: 80.
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Describe various communications networks and their main components.
2. Identify the advantages and disadvantages of a network.
3. Define the terminology associated with computer networks.
4. Identify the components associated with computer networks.
5. Develop a networking plan for yourself or a client.
6. Distinguish and explain the concepts of: hacking and cracking; authorization, and attacks.

Unit-I

The Security Problem in Computing: The meaning of Computer Security, Computer Criminals, Methods of Defense and Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms.

Unit-II

Private Key Encryption, The Data Encryption Standard, The AES Encryption Algorithm, Public Key Encryptions, and Uses of Encryption RSA algorithms.

Unit-III

Security in Network: Threats in Network, Network Security Controls, Firewalls, Intrusion Detection Systems, Secure E-mail. Buffer Overflows, Software Security, Operating System Security, Trusted Computing and Multilevel Security.

Unit-IV

Privacy and ethical issues in networks, health issues in networked, Physical and Infrastructure Security, Security Auditing, Legal and Ethical Aspects, future of networked economy.

Course Outcomes:

CO1:Analysis/Problem Solving and information literacy.

a. Students develop a secure computer network plan.
b. Students evaluate and recognize a problem as being a possible network security threat.
c. Students need to understand the security issues involved with different Network operatingsystems.

CO2:Communications

a. Students collect information from Computer network logs.
b. Students formulate a complete and adequate counter measure plan and prepare against it.
c. Students present their findings to the rest of the class.

CO3: Provide security of the data over the network.
CO4: Do research in the emerging areas of cryptography and network security.
CO5: Implement various networking protocols.
CO6: Protect any network from the threats in the world.

Mapping of Paper No. MCA-2312

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. MAIWALD and ERIC, Fundamentals of Network Security, McGraw Hill, 2010

ELECTIVE-I

PAPER: MCA- 22041 CLOUD COMPUTING

Max. Marks: 80.
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Unit - I

Cloud Computing introduction: Basic structure of cloud computing, working model for cloud computing- deployment and service model, benefits, risks, limitations, components, Types of cloud Environment, characteristics, architecture from front end and back end, Evolution. Applications (Business, Data storage & backup, Management, Social etc.)

Unit -II

Public, Private, Hybrid, Community cloud model introduction with advantages and, (SaaS IaaS-PaaS) application, characteristics, Benefits, issues. Cloud Computing (client server Technology, – Peer to Peer, Distributed Computing, GRID Computing- advantages, disadvantages, Cloud Computing infrastructure: Hypervisor, Technologies- virtualization, SOA, grid computing and utility computing., Hardware virtualization with Characteristics, Types of Hardware Virtualization, Reference model and its advantages, Cloud Computing Challenges.

Unit -III

Cloud Computing security, Boundaries, Protecting data Mechanism. Brokered Cloud Storage access Security concerns threats in cloud computing security, security mechanism- IAM (Identify and access management), PKI (Public key infrastructure), Encryption (Symmetric vs asymmetric), SSO (Single sign on), Specialized cloud architecture- Direct I/O access architecture, mLoad-balanced virtual switches, Multiple resource access architecture, Federated cloud.

Unit -IV

Mobile Cloud Computing, cloud based ERP, CRM software, supply chain management (SCM), its Benefits, CC architecture, advantages, issue and applications, Introduction of various application offered by AWS, Microsoft

AZURE, GCP, Fog Computing.

Course Outcomes

CO1: Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies.

CO2: Implement different types of Virtualization technologies and Service Oriented Architecture systems.

CO3: Elucidate the concepts of NIST Cloud Computing architecture and its design challenges.

CO4: Analyse the issues in Resource provisioning and Security governance in clouds.

CO5: Choose among various cloud technologies for implementing applications.

CO6: Install and use current cloud technologies**.**

Mapping of Paper No. MCA-22041

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Cloud Computing a practical approach, Anthony T Velte, Toby J Velte, RobertElsenpeter, Tata McGraw-HILL,2010 Edition.
2. Cloud Computing-web Based application that change the way you work and collaborate online, Michael Miller, Pearson Eduction,2009 Edition.
3. “Cloud Computing for Dummies” by Judith Hurwitz , Bloor Robin, Marcia Kaufman &Fern Halper, November 2009.

PAPER: MCA-22042 ANALYSIS AND DESIGN OF ALGORITHMS

Max. Marks: 80.
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

Unit - I

Introduction to Graphs, Sets and disjoint sets, union, sorting and searching algorithms and their analysis in terms of space and time complexity, Divide and Conquer: General method, binary search, merge sort, quick sort, selection sort, Strassen's matrix multiplication algorithms and analysis of algorithms.

Unit - II

Greedy Method: General method, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source paths and analysis. Dynamic Programming: General method, optimal binary search trees, O/I knapsack, the traveling salesperson problem.

Unit -III

Back Tracking: General method, Eight queen's problem, graph coloring, Hamiltonian cycles, analysis of these problems. Branch and Bound: Method, O/I knapsack and traveling salesperson problem, efficiency considerations, Techniques for algebraic problems, some lower bounds on parallel computations.

Unit - IV

NP Hard and NP Complete Problems: Basic concepts, Cook's theorem, NP hard graph and NP scheduling problems some simplified NP hard problems.

Course Outcomes

CO1: Argue the correctness of algorithms using inductive proofs and invariants.

CO2: Analyze worst-case running times of algorithms using asymptotic analysis.

CO3: Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and conquer algorithms. Derive and solve recurrences describing the performance of divide and-conquer algorithms.

CO4: Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
CO5: Describe the greedy paradigm and explain when an algorithmic design situation calls for it.
CO6: Argue the correctness of algorithms using inductive proofs and invariants.

Mapping of Paper No. MCA-22042

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Fundamental of Computer algorithms, Ellis Horowitz and Sartaj Sahni, 1978, Galgotia Publication.
2. Introduction To Algorithms, Thomas H Cormen, Charles E Leiserson And Ronald L Rivest: 1990, TMH
3. The Design and Analysis of Computer Algorithm, Aho A.V. Hopcroft J.E., 1974, Addison Wesley. Algorithms.
4. The Construction, Proof and Analysis of Programs, Berlion, P.Bizard, P., 1986. Johan Wiley& Sons.
5. Efficient Programs, Bentley, J.L., PHI
6. Introduction to Design and Analysis of Algorithm, Goodman, S.E. &Hedetnieni, 1997, MGH.
7. Introduction to Computers Science- An algorithms approach , Jean Paul Trembley, Richard B.Bunt, 2002, T.M.H.
8. Fundamentals of Algorithms: The Art of Computer Programming Voll, Knuth, D.E.: 1985, Naresh Publication.

PAPER: MCA-22043 MOBILE COMPUTING

Max. Marks: 80.
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. To understand the basic concepts of mobile computing.
2. To learn the basics of mobile telecommunication system.
3. To be familiar with the network layer protocols and Ad-Hoc networks.
4. To know the basis of transport and application layer protocols.
5. To gain knowledge about different mobile platforms and application development.

Unit -I

Detailed Introduction of Mobile Computing: History, Types, Benefits, Application, Evolution, Security Concern regarding Mobile Computing, Different Propagation Modes, Wireless Architecture and its types, needs of mobile user.

The cellular concept: Cellular system, hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio.

Unit -II

Telecommunication System: GSM: GSM: - Channel allocation; call routing Architecture, PLMN interface, addresses and identifiers, network aspects, frequency allocation, authentication and security, Handoffs Technique. GPRS: network operation, data services, Applications, Billing and charging.

Mobile IP: Need of mobile IP, IP packet delivery, Agent Discovery, Registration, Tunneling and encapsulation, Route optimization, IP Handoff.

Unit -III

Mobile Transport Layer: Overview of Traditional TCP and implications of mobility control. Improvement of TCP: Indirect TCP, Snoop TCP, Mobile TCP, Fast Retransmit/fast recovery, Time-out freezing, Selective retransmission.

Wireless Application Protocol: Introduction of WAP, WAP applications, WAP Architecture, WAP Protocol Stack, Challenges in WAP.

Unit -IV

Mobile Ad Hoc wireless networks: Introduction, Benefits, Difference, Routing protocols for ad hoc wireless networks: DSDV and AODV.

Introduction to 4G: Introduction, features and challenges, Applications of 4G, 4G network architecture.

Course Outcomes:

CO1: Define mobile technologies in terms of hardware, software, and communications.
CO2: Describe and analyze existing mobile computing frameworks and architectures.
CO3: Evaluate the effectiveness of different mobile computing frameworks.
CO4: Describe how mobile technology functions to enable other computing technologies.
CO5: Describe the functionality of Mobile IP and Transport Layer
CO6: Classify different types of mobile telecommunication systems

Mapping of Paper No. MCA-22043

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Asoke K Telukder, Roopa R Yavagal,MobileComputingTechnology, Applications and service creation,TMH.
2. Raj Kamal, Mobile Computing, publication, Oxford
3. William Stallings, Wireless Communications & Networks, Second Edition, Pearson
4. Kumkum Garg, Mobile Computing Theory and Practice--Pearson

PAPER: MCA-22044 CYBER SECURITY

Max. Marks: 80.
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives

1. To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
2. To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.
3. To develop graduates that can identify, analyze, and remediate computer security breaches.

Unit-I

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace. Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

Unit -II

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges. Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

Unit- III

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

Unit - IV

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013. Introduction to Cyber

Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Informationhiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

Course Outcomes

CO1: Analyze and evaluate the cyber security needs of an organization.
CO2: Conduct a cyber security risk assessment.
CO3: Measure the performance and troubleshoot cyber security systems.
CO4: Implement cyber security solutions.
CO5: Be able to use cyber security, information assurance, and cyber/computer forensics software/tools.
CO6: Identify the key cyber security vendors in the marketplace.

Mapping of Paper No. MCA-22044

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Paul van Oorschot, Computer Security and the Internet: Tools and Jewels (2020, Springer). Personal use copy freely available on author's website.
2. Wenliang Du, *Computer Security: A Hands-on Approach* (2017, self-published). Updated May 2019.
3. Stallings and Brown, *Computer Security: Principles and Practice, 3/e* (2014, Prentice Hall).
4. Dieter Gollmann, *Computer Security, 3/e* (2011, Wiley).
5. Smith, *Elementary Information Security*(2011, Jones & Bartlett Learning).
6. Mark Stamp, *Information Security: Principles and Practice, 2/e* (2011, Wiley).
7. Goodrich and Tamassia, *Introduction to Computer Security* (2010, Addison-Wesley).

ELECTIVE-II

PAPER: MCA-22051 ARTIFICIAL INTELLIGENCE

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. This subject will develop a basic understanding of the building blocks of AI and want working of intelligent agents: Search, Knowledge representation, inference, logic, and learning. Students will implement a small AI system in a team environment.
2. The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

Unit – I

Introduction and applications of artificial intelligence, Problem solving: Defining the Problem as state space search, Production system, Problem characteristics, Problem System characteristics, Search techniques: Generate and test, Hill climbing, Best first search, A* algorithm, Problem reduction, Expert system: Definition, Role of knowledge in expert system,
Architecture of expert system.

Unit – II

Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation, Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques, Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Scripts. Propositional and Predicate logics, Propositional equivalence, Rules of Inference.

Unit – III

Perception: Sensing, Speech recognition, Vision, Action, Neural networks: Introduction, Comparison of artificial neural networks with biological neural networks, learning in neural networks, Perceptrons, Back propagation networks, application of neural networks. Fuzzy logic: Definition, Difference between Boolean and Fuzzy logic, fuzzy subset, fuzzy membership function, fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller.

Unit – IV

Programming of Lisp: Background: history, installing, resources. Basics: symbols, evaluation, data types, lists, conditionals, functions, lambda forms, Emacs, REPL. Backquote, vectors, sequences, file system, loop, format, packages, streams, debugger, compiling, Prolog in Lisp, knowledge representation, constraints, unification,

Macros and Object: Macros, closures, reader macros, Error system, performance tuning, Typesystem, CLOS, Structs, FFI, OS hook, External libraries.

Course Outcomes:

CO1: Describe the modern view of AI as the study of agents that receive percepts from the Environment and perform actions.

CO2: Demonstrate awareness of informed search and exploration methods. .

CO3: Explain about AI techniques for knowledge representation, planning and uncertainty Management.

CO4: Develop knowledge of decision making and learning methods.

CO5: Describe the use of AI to solve English Communication problems.

CO6: Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.

Mapping of Paper No. MCA-22051

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.
2. Elaine Rich, Kevin Knight: Artificial Intelligence, Tata McGraw Hill.
3. Carl Townsend: Introduction to Turbo Prolog, BPB
4. Stamations V. Kartalopous: Understanding Neural Networks and Fuzzy Logic, PHI
5. Satinder Bal Gupta: Artificial Intelligence, Shree Mahavir Book Depot(Publishers), New Delhi.
6. Practical Common Lisp (Peter Seibel) http://www.gigamonkeys.com/book/
7. Common Lisp –https://www.cs.cmu.edu/~dst/LispBook/book.pdf
8. On Lisp (Paul Graham) –http://www.paulgraham.com/onlisp.html

PAPER: MCA-22052 NETWORK SECURITY AND CRYPTOGRAPHY

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. To understand cryptography theories; algorithms & systems.
2. To understand the symmetric and asymmetric key algorithms.
3. To understand necessary approaches & techniques to build protection mechanisms in order to secure Computer Networks.
4. Acquire fundamental knowledge on the concepts of different security layers.

Unit- I

Introduction: Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

Unit- II

Symmetric Key Algorithms: Introduction, algorithms types and modes, DES, AES. Asymmetric Key Algorithms: Introduction, history of asymmetric key cryptography, RSA symmetric and asymmetric key cryptography together, Digital signature.

Unit- III

Internet Security Protocols: Basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure Hyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), S SL versus SET, Electronic Money, Email Security.

Unit- IV

User Authentication And Kerberos: Introduction, Authentication basics, Passwords, authentication tokens, certificate based authentication, biometric based authentication, Kerberos, key distribution center(KDC), Security handshake pitfalls, single Sign on(SSO) approach.

Course Outcomes:

CO1: classify the symmetric encryption techniques
CO2: Illustrate various Public key cryptographic techniques
CO3: Evaluate the authentication and hash algorithms.
CO4: Discuss authentication applications

CO5: Summarize the intrusion detection and its solutions to overcome the attacks.
CO6: Basic concepts of system level security

Mapping of Paper No. MCA-22052

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Cryptography and Network Security, 2nd Edition by Atul Kahate, TMH
2. Network Management Principles & Practices by Subramanian, Mani (AWL)
3. SNMP: A Guide to Network Management (MGH)
4. Telecom Network Management by H.H. Wang (MGH)
5. Network Management by U. Dlack (MGH)

PAPER: MCA-22053 EDGE AND FOG COMPUTING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Understand the Edge and Fog computing basics: introduction, characteristics, architecture and applications.
2. Analyzing the key difference in Edge and fog computing and fog computing communication technologies.
3. Analyzing the Fog computing requirements when applied to IoT, Integration of IoT devices with fog and cloud computing.

Unit-I

Introduction to Edge Computing - Edge computing purpose and definition, Edge computing applications, Edge computing Architecture.

Introduction to Fog Computing: Fog Computing, Characteristics, Issues and challenges. Fog Computing Architecture. Applications of Fog Computing like health, transportation, smart cities, healthcare and vehicles. Edge vs Fog Computing.

Fog Computing Communication Technologies: Introduction, IEEE 802.11,4G,5G standards, WPAN, Short-Range Technologies, LPWAN and other medium and Long-Range Technologies.

Unit -II

Network Slicing in 5G, Network Slicing Management in Edge and Fog, Middleware for Fog and Edge Computing, Need for Fog and Edge Computing Middleware, Clusters for Lightweight Edge Clouds.

RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi.

Unit -III

Fog computing requirements when applied to IoT: Scalability, Interoperability, Fog-IoT architectural model, Challenges on IoT Stack Model via TCP/IP Architecture, Data Management, filtering, Event Management, Device Management, cloudification, virtualization, security and privacy issues. Integration of IoT devices with fog and cloud computing: Advantages and challenges.

Unit -IV

Networking Software and application in Fog Computing: Open Flow Protocol, Open Flow Switch, SDN in Fog Computing, Home Network using SDN.

Security Management for Edge and Fog Computing, Machine Learning based security in Fog Computing, Cyber-Physical Energy Systems over Fog Computing.

Course Outcomes:

CO1: Understanding Security and privacy issues and their management in Edge and Fog Computing.

CO2: Network Slicing Management in Edge and Fog, Software Defined Networking and application in Fog

Computing.
CO3: Introduction to RaspberryPi and its hardware layout.
CO4: Review underlying technologies, limitations, and challenges along with future research direction and discuss generic conceptual framework for optimization problems in fog computing.
CO5: Analyse the restrictions introduced by the General Data Protection Regulation (GDPR), and discuss how these legal constraints affect the design and operation of IoT applications in fog and cloud environments.
CO6: Design and develop simulation scenarios for Edge and Fog Computing using network simulator.

Mapping of Paper No. MCA-22053

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Fog Computing: Theory and Practice by Assad Abbas, Samee U. Khan, Albert Y. Zomaya
2. Fog and Edge Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing) by RajkumarBuyya and SatishNarayanaSrirama
3. Amir VahidDastjerdi and RajkumarBuyya, ―Fog Computing: Helping the Internet of Things Realize its Potential‖, University of Melbourne.
4. Sensors, Cloud, and Fog: The Enabling Technologies for the Internet of Things Paperback bySudipMisra ,SubhadeepSarkar , SubarnaChatterjee.
5. FlavioBonomi, Rodolfo Milito, PreethiNatarajan and Jiang Zhu, ―Fog Computing: A Platform for Internet of Things and Analytics‖, Big Data and Internet of Things: A Roadmap for Smart Environments, Studies in Computational Intelligence 546, DOI: 10.1007/978-3- 319-05029-4_7, © Springer International Publishing Switzerland 2014.
6. FlavioBonomi, Rodolfo Milito, Jiang Zhu, SateeshAddepalli, ―Fog Computing and Its Role in the Internet of Things‖, MCC'12, August 17, 2012, Helsinki, Finland. Copyright 2012 ACM 978- 1-4503-1519-7/12/08... $15.00.
7. Shanhe Yi, Cheng Li, Qun Li, ―A Survey of Fog Computing: Concepts, Applications and 9. Issues‖, Mobidata'15, ACM 978-1-4503-3524-9/15/06, DOI: 10.1145/2757384.2757397, June 21, 2015, Hangzhou, China..

PAPER: MCA-22054 BLOCKCHAIN TECHNOLOGY & QUANTUM COMPUTING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objective:

1. The students should be able to understand a broad overview of the essential concepts of blockchain technology and quantum computing.
2. To familiarize students to lay the foundation necessary for developing applications and programming in blockchain technology and quantum computing.
3. Students should be able to programme and apply blockchain technology and quantum computing in different areas.

Unit-I

Introduction: History of Blockchain, Overview, Characteristics, Benefits, Limitations Transactions and Blocks, Distributed Systems**,** Peer to Peer Network, Public key Cryptography, Hashing.
Types of Blockchain: Public Blockchain, Private Blockchain, Consortium Blockchain, Application Areas, Digital Signature, Digital Wallet.

Unit -II

Blockchain Protocol, Currency, Mining, Consensus: Proof of Work, Proof of Stake, Byzantine Generals' Computing Problems, 51% attack, Double Spending Problem.
Tiers of Blockchain Technology: Blockchain 1.0, Blockchain 2.0, Blockchain 3.0, Blockchain 4.0.

Unit -III

Bitcoin Blockchain: Structure, Operations, Features, Consensus Model, Incentive Model, Token, ERC20, ERC721
Ethereum: Introduction, Structure, Operations, Smart Contracts, Blockchain Development on Ethereum, creating a Block, Adding the Hash Function to the Block, Ethereum Virtual Machine Creating Smart Contracts, Bitcoin vs Ethereum.

Unit-IV

Introduction to Quantum Computation: Historical background of Quantum Computing, Qbits, and Bloch sphere representation of a qubit, multiple qubits. Basic mathematics for Quantum Computing.
Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits. Quantum Information and Cryptography: Comparison between classical and quantum information theory, Grover & Shor Algorithm, Bell states.

CourseOutcomes:

CO1: Explain design principles of Bitcoin and Ethereum.
CO2: Explain Nakamoto consensus.
CO3: Explain the Simplified Payment Verification protocol.
CO4: List and describe differences between proof-of-work and proof-of-stake consensus.
CO5: Interact with a blockchain system by sending and reading transactions.
CO6: Design, build, and deploy a distributed application.

Mapping of Paper No. MCA-22054

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1
CO1	S	S	S	M	S	S	M	S	S	M	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S
CO3	S	M	S	S	M	M	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S

S = Strong, M = Medium, W = Weak

References

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press. 2002
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific. 2004
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms 2000
4. Kirankalyan Kulkarni, Essentials of Bitcoin and Blockchain, Packt Publishing.
5. Tiana Laurence, Blockchain for Dummies, 2nd Edition 2019, John Wiley & Sons.
6. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashir, Packt Publishing (2017).
7. Blockchain: Blueprint for a New Economy by Melanie Swan, Shroff Publisher O'Reilly Publisher Media; 1st edition (2015).
8. Mastering Bitcoin: Programming the Open Blockchain by Andreas Antonopoulos. Corresponding

ELECTIVE-III

PAPER: MCA-23041 INTERNET OF THINGS

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time. It's becoming the Internet of Things (IoT).
2. The course enables student to understand the basics of Internet of things and protocols.
3. It introduces some of the application areas where Internet of Things can be applied.
4. Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things Course Contents:

Unit -I

Introduction of IoT, importance, Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

Unit -II

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security.

Unit -III

Introduction to Arduino IDE, Arduino Code Basics, Raspberry Pi, Assembling the Pi, IoT Open source architecture (OIC) - OIC Architecture & Design principles- IoT Devices and deployment models.

Unit -IV

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoTPortals and Business Intelligence. IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms/middleware.

Course Outcomes:

CO1: Able to understand the application areas of IOT.
CO2: Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
CO3: Able to understand building blocks of Internet of Things and characteristics.
CO4: Implement interfacing of various sensors with Arduino/Raspberry Pi.
CO5: Demonstrate the ability to transmit data wirelessly between different devices.

CO6: Show an ability to upload/download sensor data on cloud and server.

Mapping of Paper No. MCA-23041

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Vijay Madisetti, ArshdeepBahga," Internet of Things A Hands-On- Approach",2014.
2. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

PAPER: MCA-23042 ANDROID MOBILE APP DEVELOPMENT

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. To facilitate students to understand android SDK.
2. To help students to gain a basic understanding of Android application development.
3. To inculcate working knowledge of Android Studio development tool.

Unit -I

Introduction: Mobile operating system, Operating system structure, Constraints and Restrictions, Hardware configuration with mobile operating system, Features: Multitasking Scheduling, Memory Allocation, File System Interface, Keypad Interface, I/O Interface, Protection and Security, Multimedia features

Unit -II

Introduction to Mobile development IDE's, Introduction to Worklight basics, Optimization, pages and fragments , Writing a basic program- in Worklight Studio, Client technologies, Client side debugging, Creating adapters, Invoking adapters from Worklight Client application, Common Controls, Using Java in adapters, Programming exercise with Skins, Understanding Apache Cordova.

Unit -III

Understanding Apple iOS development, Android development, Shell Development, Creating Java ME application, Exploring the Worklight Server, Working with UI frameworks, Authentication, Push notification, SMS Notifications, Globalization.

Unit -IV

Android: Introduction to Android, Architecture, memory management, communication protocols, application development methods, deployment. iOS: Introduction to iOS, Architecture, memory management, communication protocols, application development methods, deployment

Course Outcomes:

CO1: To facilitate students to understand android SDK.
CO2: To help students to gain a basic understanding of Android application development.
CO3: To inculcate working knowledge of Android Studio development tool.
CO4: Install and configure Android application development tools.
CO5: Design and develop user Interfaces for the Android platform.
CO6: Save state information across important operating system events.

Mapping of Paper No. MCA-23042

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Anubhav Pradhan, Anil V Deshpande, " Mobile Apps Development" Edition:
2. Jeff McWherter, Scott Gowell "Professional Mobile Application Development", John Wiley & Sons, 2012.
3. Barry Burd, "Android Application Development All in one for Dummies", Edition: I
4. Teach Yourself Android Application Development In 24 Hours, Edition: I, Publication: SAMS
5. Neal Goldstein, Tony Bove, "iPhone Application Development All-In-One For Dummies", John Wiley & Sons

PAPER: MCA-23043 NATURAL LANGUAGE PROCESSING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. To learn the fundamentals of natural language processing.
2. To understand the use of CFG and PCFG in NLP.
3. To understand the role of semantics of sentences and pragmatics.
4. To apply the NLP techniques to IR applications.

Unit-I

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

Unit -II

Word Level Analysis Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

Unit-III

Syntactic Analysis Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

Unit-IV

Discourse, Analysis and Lexical Resources Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brills Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Course Outcomes:

CO1: To tag a given text with basic Language features
CO2: To design an innovative application using NLP components
CO3: To implement a rule based system to tackle morphology/syntax of a language
CO4: Design a tag set to be used for statistical processing for real-time applications
CO5: To compare and contrast the use of different statistical approaches for different types of NLP applications.
CO6: Design NLP-based AI systems for question answering, text summarization, and machine translation.

Mapping of Paper No. MCA-23043

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Daniel Jurafsky, James H. MartinSpeech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Pythonll, First Edition, OReilly Media, 2009.
3. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
4. Richard M Reese, Natural Language Processing with Javall, OReilly Media, 2015.
5. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
6. Tanveer Siddiqui, U.S. Tiwary, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

PAPER: MCA-23044 DIGITAL MARKETING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. The purpose of this syllabus is to make students aware about the basics of marketing.
2. The course discusses about the important role of Digital Marketing in present age of Information Technology.

Unit – I

Introduction to Marketing, Importance and Scope of Marketing, Elements of Marketing - Needs, Wants, Demands, Consumer, Markets and Marketers; Marketing vs. Sales. Introduction to Digital Marketing, Benefits & Opportunity of Digital Marketing, Inbound and Outbound Marketing, Content Marketing, Understanding Traffic, Understanding Leads, Digital Marketing use in 'Business to Business' (B2B), 'Business to Consumer' (B2C) and 'Not-for Profit' marketing

Unit-II

Search Marketing (SEO): Introduction to Search Engine , Search Engine Optimization (SEO), importance of SEO for business websites, Search Results & Positioning, Benefits of Search Positioning, Role of Keywords in SEO, Meta Tags and Meta Description, On-page & Off-page optimization, Back Link, Internal & External Links, Ranking, SEO Site Map, Steps for B2B SEO and B2C SEO, Advantages & Disadvantages of SEO. Email Marketing: Introduction to Email Marketing, Elements of Email, Email List Generation, Email Structure, Email Delivery, Online Data Capture, Off Line data Capture, Creating an Email campaign, Campaign Measurement, Concept of A/B testing &its use in email marketing.

Unit –III

Digital Display Advertising: Concepts, Benefits, Challenges, Ad Formats, Ad Features, Ad Display Frequency. Overview of Google AdWords. Social Media Marketing: Key Concepts, Different Social Media Channels – Facebook, YouTube, Twitter, Instagram, Business Page Setup and Profile, Social Media Content, Impact of Social Media on SEO, Basic concepts – CPC, PPC, CPM, CTR, CR. Importance of Landing Page. How to create & test landing Pages. User Generated Content (Wikipedia etc.), Multi-media - Video (Video Streaming, YouTube etc), Multi-media - Audio & Podcasting (iTunes etc), Multimedia - Photos/Images (Flickr etc).

Unit -IV

Introduction to Mobile Marketing, Overview of the B2B and B2C Mobile Marketing, Use of Mobile Sites, Apps (Applications) and Widgets, Overview of Blogging Web Analytics: Introduction to Web Analytics, Web Analytics – Types & Levels, Introduction of Analytics Tools and it’s use case (Google Analytics and others), Analytics

Reporting, Traffic and Behaviour Report, Evaluate Conversions.

Course Outcomes

CO1: To understand basics of marketing and digital marketing.
CO2: To analyse the role of search engine in improving digital marketing and understand about the basics and importance of email marketing.
CO3: To analyse role of social media marketing for the given problem.
CO4: To understand about the basics and importance of web marketing and mobile marketing.
CO5: Analyse the confluence of marketing, operations, and human resources in real-time delivery.
CO6: Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.

Mapping of Paper No. MCA-23044

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Stanton William J., Fundamentals of Marketing, McGraw Hill, N. Delhi.
2. VandanaAhuja, Digital Marketing, Oxford Higher Education.
3. Seema Gupta, Digital Marketing, McGrawHill.

ELECTIVE-IV

PAPER: MCA-23051 .NET PROGRAMMING WITH C#

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives

1. To learn programming in C # programming language.
2. To gain knowledge of object-oriented paradigm in the C # programming language.
3. To gain knowledge of .NET environments.

Unit-I

Introduction to .Net, Two tier and Three tier client server model, .Net Architecture, Features of .Net, Advantages of .Net, .Net Framework, CLR, CTS, CLS, JIT, Assemblies, Memory management issues – Garbage Collector and collection process, Assemblies, .NET framework class library, Managed code, interoperability with unmanaged code.

Unit-II

Data Types, Operators, Access Specifier: Private, Public, Protected and Internal, Classes, Methods, Static Method, Array, Jagged Array, Collection (Array list, Hash table, Dictionary), Property and Indexer (One Dimension, two dimensional), Delegates and events, Exception Handling. Encapsulation, Abstraction, Inheritance, interface, polymorphism (Overloading, Overriding).

Unit-III

ADO v/s ADO.Net, ADO.Net data namespaces, ADO.Net Object Model, Accessing data from Server, Creating Connection, Command, Data Adapter, Data Reader and Data Set with OLEDB and SQLDB, Data Binding. GUI Programming – Common Controls, Properties, Methods and Events. Interacting with controls - Textbox, Label, Button, Listbox, Combobox, Checkbox, Picture Box, Radio Button, Panel, scroll bar, Timer, ListView, TreeView, toolbar, Status Bar. Dialog Controls, Creating and Using MDI applications, Toolbar, Creating Menus, Data Grid view, Crystal Report

Unit-IV

ASP.Net : Server Controls : label, dropdown list box, validation controls, list box, text box, radio button, check box, image, DateTimePicker control, Multiview, Introduction to Ajax controls, State Management: session, caching, Authentication(window,.Net Passport, Forms Based), Authorization, web services.

Course Outcomes:

CO1: Knowledge of the structure and model of the programming language C #
CO2:Understanding of Programming language C# for various use of programming technologies
CO3: Can Develop Application software in C #
CO4: Understand code solutions and compile C# projects within the .NET framework.
CO5: Design and develop professional console and window based .NET application
CO6: Demonstrate knowledge of object-oriented concepts Design user experience and functional requirements C#.NET application.

Mapping of Paper No. MCA-23051

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	M	S	S	M	S	S	M	S	S	S	S	S
CO2	M	S	S	S	S	S	S	S	S	S	M	S	S	M	M
CO3	S	M	S	S	M	M	S	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	M	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. C# 2010 Programming Black Book, by Kogent Learning Solutions, Wiley India.
2. Jeffrey Richter, Francesco Balena: Applied .Net Framework Prog. In MS VB.Net, TMH Publication.
3. Herbert Schildt: Complete Reference C#, TMH Publication.
4. Michael Halvorsan: Microsoft Visual Basic.NET step by step, PHI Publication.
5. G.Andew Duthie: Microsoft ASP.Net with C#.Net step by step, PHI Publication.

PAPER: MCA-23052 R PROGRAMMING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives

1. Expand R by installing R packages.
2. Explore and understand how to use the R documentation.
3. Read Structured Data into R from various sources.
4. Understand the different data types in R.
5. Understand how to create and manipulate dates in R.

Unit-1

Introducing to R – Installing R and RStudio, R data types and objects, Control structures, functions, scoping rules, dates and times. R Data Structures – Help functions in R – Vectors – Scalars – Declarations – recycling – Common Vector operations – Using all and any – Vectorized operations – NA and NULL values – Filtering – Vectorised if-then else – Vector Equality – Vector Element names

Unit-II

Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction – Higher Dimensional arrays – lists – Creating lists – General list operations

Accessing list components and values – applying functions to lists – recursive lists.

Unit-III

Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames – Factors and Tables – factors and levels – Common functions used with factors – Working with tables - Other factors and table related functions - Control statements – Arithmetic and Boolean operators and values – Default values for arguments - Returning Boolean values – functions are objects – Environment and Scope issues – Writing Upstairs - Recursion – Replacement functions – Tools for composing function code – Math and Simulations in R

Unit-IV

S3 Classes – S4 Classes – Managing your objects – Input/Output – accessing keyboard and monitor – reading and writing files – accessing the internet – String Manipulation – Graphics – Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots.

Course Outcomes:

CO1: Understand the basics in R programming in terms of constructs, control statements, string functions.
CO2: Understand the use of R for Big Data analytics.
CO3: Use file management and version control tools.
CO4: Perform simple arithmetic and statistical operations in R.
CO5: Learn to apply R programming for Text processing.
CO6: Able to appreciate and apply the R programming from a statistical perspective.

Mapping of Paper No. MCA-23052

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	M	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	M	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. Norman Matloff, The Art of R Programming: A Tour of Statistical Software Design, No Starch Press, 2011.
2. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Addison-Wesley Data & Analytics Series, 2013
3. Beginning R – The Statistical Programming Language,MarkGardener,Wiley, 2013
4. Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R, Robert Knell, Amazon Digital South Asia Services Inc, 2013

PAPER: MCA-23053 NOSQL DATABASE

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives

1. Distinguish the different types of NoSQL databases
2. Understand the impact of the cluster on database design
3. State the CAP theorem and explain it main points
4. Explain where HBase, MongoDB, Cassandra, Neo4j, and Redis fit with the CAP theorem
5. Work with the Hadoop Distributed File System (HDFS) as a foundation for NoSQL technologies
6. Warehouse HDFS data using Apache Hive

Unit-1

Overview, History of NoSQL Databases Definition, Types of NoSQL Database, the Value of Relational Databases, Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points.

Unit-II

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases, Replication and sharding, MapReduce on databases Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

Unit-III

NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive NoSQL Key/Value databases using MongoDB, Document Databases, What Is a Document Database? Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real
Time Analytics, E-Commerce Applications.

Unit-IV

Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure. Column-oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, What Is a Column-Family Data Store. Graph of NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, What Is a Graph Database?

Course Outcomes:

CO1: Define, compare and use the four types of NoSQL Databases (Document-oriented, KeyValue Pairs, Column-oriented and Graph).

CO2: Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.

CO3: Explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

CO4: Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Key-Value Pair NoSQL databases.

CO5: Explain the detailed architecture, define objects, load data, query data and performance tune Graph NoSQL databases.

CO6: Evaluate NoSQL database development tools and programming languages.

Mapping of Paper No. MCA-23053

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	M	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	M	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CO6	S	S	S	S	S	M	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Author: Sadalage, P. & Fowler, Publication: Pearson Education
2. A Guide to Modern Databases and the NoSQL Movement Edition, Redmond, E. &Wilson, 1st Edition.

Paper: MCA-23054 PHP

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.

Learning Objectives:

1. Understand how server-side programming works on the web.
2. PHP Basic syntax for variable types and calculations.
3. Creating conditional structures.
4. Storing data in arrays.
5. Using PHP built-in functions and creating custom functions.

Unit- I

Introduction to PHP, Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression. Decisions and loop Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.

Unit- II

Function: Define a function, Call by value and Call by reference, Recursive function, String Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function. Array Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and for each(), Some useful Library function.

Unit- III

Handling Html Form with PHP Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission. Working with file and Directories Understanding file & directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

Unit- IV

Session and Cookie Introduction to Session Control, Session Functionality what is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session. Exception Handling Understanding Exception and error, Try, catch, throw. Error tracking and debugging.

Course Outcomes:

CO1: Write regular expressions including modifiers, operators, and Meta characters.
CO2: Create PHP programs that use various PHP library functions, and that manipulate files and directories.
CO3: Hands on experience on various techniques of web development and will be able to design and develop a complete website.
CO4: Analyze the construction of a web page and relate how PHP and HTML combine to produce the web page.
CO5: Compare and contrast PHP variable types, and relate the advantages and disadvantages of PHP variables with local or global CO6: scope. Formulate, design and create PHP control structures, including selection and iterative structures

Mapping of Paper No. MCA-23054

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	S	S	S	S	S	S	M	S	S	M	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	M	S	S	M	S
CO3	S	M	S	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	M	S	S	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	S	S	S	S	M	S	S	S	S	S	S
CO6	S	S	S	S	S	S	S	S	S	S	S	S	M	S	S

S = Strong, M = Medium, W = Weak

References:

1. The Joy of PHP Programming: A Beginner's Guide – by Alan Forbes
2. PHP & MySQL Novice to Ninja – by Kevin Yank
3. Head First PHP & MySQL – by Lynn Beighley& Michael Morrison
4. Learning PHP, MySQL, JavaScript, and CSS: A Step-by-Step Guide to Creating Dynamic Websites – by Robin Nixon

Teaching-Learning Process

- Lectures
- Discussions
- Participative Learning
- Interactive Sessions
- Assignments
- Research-Based Learning/Project Work
- Technology-Embedded Learning
- Hands on Training

Assessment and Evaluation

- Overall assessment will be made as per I.G.U. PG ordinances
- Continuous Comprehensive Evaluation at regular after achievement of each Course outcome
- Formative Assessment on the basis of activities of a learner throughout the programme instead of one-time assessment
- Oral Examinations to test presentation and communication skills
- Group Examinations on Problem solving exercises
- Collaborative Assignments

Keywords

- LOCF
- CBCS
- Face to face (F to F) Learning
- Programme Outcomes
- Programme Specific Outcomes
- Course OutcomeFormative Assessment and Evaluation
- Comprehensive and Continuous Evaluation

References

- National Education Policy-2020. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- The draft subject specific LOCF templates available on UGC website. https://www.ugc.ac.in/ugc_notices.aspx?id=MjY5OQ==

Appendices

- Curricular Reforms — Extracts from National Education Policy-2020
- The draft subject specific LOCF templates available on UGC website. https://www.ugc.ac.in/ugc_notices.aspx?id=MjY5OQ==