



Manav Rachna International Institute of Research and Studies

(Deemed to be University under section 3 of the UGC Act, 1956)

School of Computer Applications

Department of Computer Applications

Curriculum

And

Scheme of Examination

Master of Computer Applications

Batch: - 2023-2025

FOREWORD

This is to certify that this booklet contains the entire Curriculum and Scheme of Examination of Master of Computer Applications being offered at School of Computer Applications of this University. This has been duly vetted and finally approved by the Academic Council of the University vide its 42nd meeting held on 03-03-2023 and changes, if any deemed appropriate, shall be duly incorporated after the necessary approval by the Academic Council.

This Curriculum and Scheme of Examination of Master of Computer Applications shall be implemented w.e.f. AY 2023-25.

Date:

Dean-Academics, MRIIRS

PREAMBLE

The program MCA is adapted to an outcome based education system which would enable the students to acquire the capabilities to meet the demands of society and industry at regional, national and global level. The Program Education Objectives (PEOs) of MCA are consistent with the Vision and Mission of the Department as well as the University, and aim to produce globally successful IT professionals who are empowered to contribute to nation building through sound knowledge, technical skills and research aptitude. The POs and PSOs address the PEOs and aim to produce innovators, IT professionals, entrepreneurs and technocrats with high professional and social ethics.

The curriculum exhibits the requisite balance among the fundamental, core and elective subjects. This is to create a MCA student talent pool that can serve the IT technological needs of the software industry. Many courses are meant to meet the IT technological needs such as Big Data Analytics, Python Programming, R Programming, Network Security and Cryptography, Android Application Development, Mobile Computing and Database Administration etc. .

The curriculum includes courses focusing on employability, entrepreneurship and skill development which map strongly with the PO defining demonstration of technical knowledge and engagement in independent and life-long learning. Examples of such courses are Analytics of Business Strategy, Managing Sales Process and so on.

Certain courses are meant to create awareness about the environment and sustainability and inculcate professional ethics, meeting the requisites of POs defining these characteristic such as Employability Skills Enhancement etc.

The design of curriculum is done in accordance with the predetermined Program Education Objectives. The syllabus content of each course is meticulously created to develop thorough understanding and gain in-depth knowledge in the subject. A number of theory courses are accompanied with laboratory courses to inculcate the practical skills. In order to ensure the effectiveness of teaching-learning process and true implementation of the curriculum, the course outcomes of each course are developed to meet the program outcomes and program specific outcomes, which are also reflected in the Course Articulation Matrix. Course outcome and program outcome attainment is measured through direct and indirect tools including internal assessments, assignments, end semester examinations, dissertations and projects etc.

Although the curriculum had been designed after thorough deliberations involving experts from academia and industry, and considering the feedbacks obtained from various stakeholders, there is always a scope of regular revision and updation of the syllabus keeping in view the changing needs of the industry and society. Thus a well-articulated process is followed to revise the curriculum from time to time. The process begins with obtaining feedbacks from various stakeholders i.e. students, faculty, alumni, parents and industry experts. The feedbacks are analyzed and relevant suggestions are incorporated in the curriculum through a Curriculum revision workshop under the supervision of Departmental Academic Committee (DAC). The revised curriculum is scrutinized by the Board of Studies (BOS) and suggestions of the BOS are also incorporated. The revised curriculum is then placed before the Board of Faculty for consideration which is further reviewed and approved by the Academic Council.

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MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

SCHOOL OF COMPUTER APPLICATIONS

DEPARTMENT OF COMPUTER APPLICATIONS

VISION AND MISSION

VISION

To be a reputed source for globally competent professionals in computer applications through strong research and teaching environment; to empower them to become socially and economically responsible citizens for the betterment of society.

MISSION

1. To impart theoretical and practical training in advanced areas of computer applications and contribute new knowledge through analytical learning which encourages creativity, insight development and a passion for information technology.
2. To provide better ambience for research in order to enhance the performance of faculty members and scholars while continually providing conducive teaching- learning and research environment.
3. To provide learning ambience to generate innovative and problem solving skills with professionalism.

ABOUT THE DEPARTMENT

Department of Computer Applications is one of the oldest departments of the university engaged in teaching and research in computer applications. Currently, it is offering BCA, B.Sc (IT) and MCA programmes with latest, industry-ready curriculum which is being kept regularly updated in the light of latest developments in the IT industry. There is great thrust on practical applications. We provide a highly interactive learning environment so that the students get a full feel of the subject and get fully involved in the acquisition of computer skills. Students are encouraged in innovative and critical thinking in various computer languages, platforms and protocols. They are exposed to live industry projects to enable them to gain insights into the working of the industry.

PROGRAM EDUCATION OBJECTIVES (PEOs)

The objective of the programme is to develop students to work in fields of Computer Applications in various sectors together with internet technologies, e-business applications etc. The MCA program is focused on exposing students to business application areas. The program provides a strong foundation with an integrated understanding of Information Technology based applications. The program is designed to impart the concepts, values, challenges, opportunities and latest trends in the field of Computer Science to develop a broad practical understanding of its context, purpose, and underlying functional areas. The MCA programme tends more towards software application development and exposure to the latest software tools and techniques to develop the applications. Following are Program Educational Objectives of MCA:

- PEO 1.** To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms in the field of Computer Applications.
- PEO 2.** To provide students a solid foundation in computing fundamentals and techniques required to solve related problems and also to pursue higher studies and research.
- PEO 3.** To inculcate students in professional and ethical attitude, effective communication skills, multidisciplinary approach and an ability to relate computing issues to broader social context.

PEO 4. To provide students an academic environment for excellence, leadership and continuous learning, on technology and trends needed for a successful career.

PROGRAM SPECIFIC OBJECTIVES & PROGRAM OUTCOMES

PROGRAM SPECIFIC OBJECTIVES (PSO):

When the PEO's are achieved, the post graduates will be:

PSO 1. Ability to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science.

PSO 2. Comprehend, explore and build up computer programs in the areas allied to Algorithms, System Software, Multimedia, Web Design and Big Data Analytics for efficient design of computer-based systems of varying complexity.

PROGRAM OUTCOMES (POs)

Programme outcomes are attributes of the graduates from the programme that are indicative of the graduates' ability and competence to work as an IT professional upon graduation. Program Outcomes are statements that describe what students are expected to do now or do by the time of post-graduation. They must relate to knowledge and skills that the students acquire from the programme. The achievement of all outcomes indicates that the student is well prepared to achieve the program educational objectives down the road. The department of Computer Applications has following PO's.

PO1. Computational Knowledge: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.

PO2. Problem Analysis: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.

PO3. Design / Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies

PO4. Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data and provide well informed conclusions.

PO5. Modern Tool Usage: Ability to select modern computing tools, skills and techniques necessary for innovative software solutions

PO6. Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.

PO7. Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.

PO8. Project Management and Finance: Ability to understand, management and computing principles with computing knowledge to manage projects in multidisciplinary environments.

PO9. Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.

PO10. Societal & Environmental Concern: Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.

PO11. Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment.

PO12. Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.

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MAPPING OF PEOs WITH POs and PSOs

Program Outcome(PO)/ Program Specific Outcome (PSO)		PEOs that are attained through concerned PO
PO1	Computational Knowledge: Understand and apply mathematical foundation, computing and domain knowledge for the conceptualization of computing models from defined problems.	1,2
PO2	Problem Analysis: Ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.	1,2
PO3	Design / Development of Solutions: Ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies..	1,2,3
PO4	Conduct Investigations of Complex Computing Problems: Ability to devise and conduct experiments, interpret data and provide well informed conclusions.	2,3
PO5	Modern Tool Usage: Ability to select modern computing tools, skills and techniques necessary for innovative software solutions	2
PO6	Professional Ethics: Ability to apply and commit professional ethics and cyber regulations in a global economic environment.	3
PO7	Life-long Learning: Recognize the need for and develop the ability to engage in continuous learning as a Computing professional	3,4
PO8	Project Management: Ability to understand management and computing principles with computing knowledge to manage projects in multidisciplinary environments.	2,3
PO9	Communication Efficacy: Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.	3,4
PO10	Societal & Environmental Concern: Ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practice.	3,4
PO11	Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment	3,4
PO12	Innovation and Entrepreneurship: Identify opportunities, entrepreneurship vision and use of innovative ideas to create value and wealth for the betterment of the individual and society.	1,3

PSO1	Ability to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer science.	1,2,4
PSO2	Comprehend, explore and build up computer programs in the areas allied to Algorithms, System Software, Multimedia, Web Design and Big Data Analytics for efficient design of computer-based systems of varying complexity.	1,2,3

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SEMESTER SYSTEM AND CHOICE BASED CREDIT SYSTEM

Credit based system of study and student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grade obtained by the student, grade point average is calculated

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for lecture, tutorial and laboratory/clinical practice in a week. A few courses/activities are without credit (s) and are referred to as Audit Pass Courses (APC) but are mandatory to pass as a partial fulfilment of award of degree.

(b) Earning of credits

At the end of every course, a letter "Grade" shall be awarded in each course for which a student has registered. On obtaining a minimum Pass Grade, student shall accumulate the course credits as Earned Credits. A student's performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however shall be mandatory to pass as a partial fulfilment of award of degree.

For Award of Degree of a programme **Masters of Computer Applications**, he/she has to earn minimum **80 credits** during the 2 year duration of the programme **in 4 semesters**.

The total credits required to be earned have been further classified under two baskets of courses: "Compulsory Courses Basket", and "Elective Courses Basket". The **total 64 credits** required to be earned under "**Compulsory Courses Basket**" and **16 credits** under "**Elective Courses Basket**".

All courses under "Compulsory Courses Basket", are required to be qualified and cleared/pass by each and every students enrolled under the programme and are semester-wise listed in the study scheme along with credits assigned to each course.

Under Elective Courses Basket, there will be three types of courses:

- Semester-wise courses offered by the department itself
- Open/Inter-disciplinary courses offered at the Institute/University level notified from the office of Dean-Academics.
- Massive Open Online Courses (MOOCs) available on SWAYAM Platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under "Elective Courses Basket" depending upon his/her interest, capability/pace of learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the "Elective Courses Basket" during the entire programme duration.

However, for registration of courses [including courses under "Compulsory Courses Basket", "Elective Courses Basket" and Previous Semester Courses (wherein he/she was declared in-eligible on the basis of attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.

MCA STUDY SCHEME (FOR 2023-25 Batch)

Semester-I

Course Type	Course Name	Course Code	L	T	P	Total	Int marks	Ext marks	Total	Duration of Exam	Credits
Core	Research Innovation Catalyst-I	MCA-RIC-I		1		1	50		50	-	0.5
Core	Linear Algebra & Statistical Techniques	MCA-DS-110	2	2		4	100	100	200	3	3
Core	Data Structures	MCA-DS-111	3			3	100	100	200	3	3
Core	Object oriented programming in Java	MCA-DS-112	3			3	100	100	200	3	3
Core	Python Programming	MCA-DS-113	2			2	100	100	200	3	2
Core	Data Structures Lab	MCA-DS-161			2	2	50	50	100	2	1
Core	Object oriented programming in Java Lab	MCA-DS-162			2	2	50	50	100	2	1
Core	Python Programming Lab	MCA-DS-163			2	2	50	50	100	2	1
Domain Elective	Elective-I		2			2	100	100	200	3	2
Domain Elective	Elective-II		2	1	1	2	100	100	200	3	2
Core	Placement Competency Enhancement -I	CDC 511		4		4	50	50	100	2	2
Bridge	Fundamentals of Computer Programming	MCA-DS-001	2			2	100	100	200	3	Audit Pass
Bridge	Elements of Mathematics	MCA-DS-002	2			2	100	100	200	3	Audit Pass
Total Credits											20.5

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
ELECTIV E-I	MATLAB (MCA-DS-115)	Azure Fundamentals (MCA-CC-001)	Concepts of AI & Machine Learning. (MCA-AI-001)	Network Security (MCA-CS-001)	Gaming Technology – I (MCA-FSD-001)	Mobile Computing Basics (MCA-MC-001)	Digital methods I: Photoshop, Illustrator (MCA-MM-001)
	Soft Programming (MCA-DS-116)	Fundamentals of Cloud Computing (MCA-CC-002)	Probabilistic Reasoning (MCA-AI-002)	Cyber Security (MCA-CS-002)	Advanced Web Technologies. (MCA-FSD-002)	Mobile Software Technologies. (MCA-MC-002)	Animation Fundamentals (MCA-MM-002)
		IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
ELECTIV E-II	Basics of E-Commerce (MCA-DS-117)	IoT Basics and Technology (MCA-IOT-001)	Probability and Statistics (MCA-DaS-001)	Introduction to block chain (MCA-BC-001)	DevOps Essentials (MCA-DO-001)	Fundamentals of Computer Networks (MCA-CN-001)	Augmented Reality Foundations (MCA-AR-001)
	Introduction to Open Source Software and Open Standards (MCA-DS-118)	Hardware Architectures (MCA-IOT-002)	Introduction to Data Science (MCA-DaS-002)	Block chain implementation and applications (MCA-BC-002)	AWS Services (MCA-DO-002)	Routing Protocols and Architectures (MCA-CN-002)	Animation and Rendering Techniques (MCA-AR-002)

Semester-II

Course Type	Course Name	Course Code	L	T	P	Total	Int marks	Ext marks	Total	Duration of Exam	Credits
Core	Research Innovation Catalyst-II	MCA-RIC-II		1		1	50		50	-	0.5
Core	Data Communications	MCA-DS-210	3			3	100	100	200	3	3
Core	Analysis & Design of Algorithm	MCA-DS-211	3			3	100	100	200	3	3
Core	Introduction to Artificial Intelligence	MCA-DS-212	3			3	100	100	200	3	3
Core	Vocational Training	MCA-DS-213					100		100	2	2
Core	R Programming Lab	MCA-DS-263			2	2	50	50	100	2	1
Core	Android Application Development Lab	MCA-DS-264			2	2	50	50	100	2	1
Fundamentals	Placement Competency Enhancement-II	CDC 512		4		2	50	50	100	2	2
Domain Elective	Elective-III		2			2	100	100	200	3	2
Domain Elective	Elective-IV		2	1	1	2	100	100	200	3	2
Total Credits											19.5

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
Elective-III	Computer Graphics (MCA-DS-214)	Cloud Computing Platforms (MCA-CC-003)	Supervised Learning (MCA-AI-003)	Cryptographic (MCA-CS-003)	Gaming Technology -II (MCA-FSD-003)	Autmotive Computing (MCA-MC-003)	Compositing and Visual Effect (MCA-MM-003)
	Web Applications Development using PHP (MCA-DS-215)	Programming with AWS (MCA-CC-004)	Text Mining (MCA-AI-004)	Ethical Hacking. (MCA-CS-004)	Angular (MCA-FSD-004)	Mobile games (MCA-MC-004)	Modelling & Texturing (MCA-MM-004)
		IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
Elective-IV	Advance Database Systems (MCA-DS-216)	Communication technologies in IoT (MCA-IOT-003)	Data Analytics & Visualization using Excel (MCA-DaS-003)	Blockchain architecture (MCA-BC-003)	DevOps Software Engineering (MCA-DO-003)	Network Protocols (MCA-CN-003)	3D Models for Augmented and Virtual Reality (MCA-AR-003)
	Social Network Analytics (MCA-DS-217)	Software & Programming in IoT (MCA-IOT-004)	Data Analytics & Visualization using Python (MCA-DaS-004)	Blockchain and smart contracts (MCA-BC-004)	Continous integration & Version Control (MCA-DO-004)	TCP/IP (MCA-CN-004)	VR and 360 Video Production (MCA-AR-004)

Semester-III

Course Type	Course Name	Course Code	L	T	P	Total	Int marks	Ext marks	Total	Duration of Exam	Credits
Core	Research Innovation Catalyst-III	MCA-RIC-III		2	2		100		100	-	1
Core	Data Mining and warehousing	MCA-DS-310	3			3	100	100	200	3	3
Core	Software Engineering & Testing	MCA-DS-311	3			3	100	100	200	3	3
Core	Operations Research	MCA-DS-312	3			3	100	100	200	3	3
Core	Big Data Analytics	MCA-DS-314	2	1	1	2	100	100	200	3	2
Domain Elective	Elective-V		2			2	100	100	200	3	2
Domain Elective	Elective-VI		2			2	100	100	200	3	2
Core	Data Mining Lab	MCA-DS-360			2	2	50	50	100	2	1
Core	Big Data Analytics Lab	MCA-DS-364			2	2	50	50	100	2	1
Total Credits											18

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
Elective-V	Automata Theory (MCA-DS-316)	Cloud Data Storage & Management (MCA-CC-005)	Unsupervised Learning (MCA-AI-005)	Cyber Forensics (MCA-CS-005)	Agile, Design thinking and DevOps (MCA-FSD-005)	Smart Energy (MCA-MC-005)	Multimedia effects in Acting and Choreography (MCA-MM-005)
	Compiler Design (MCA-DS-317)	Programming with GAE (MCA-CC-006)	IoT with machine Learning (MCA-AI-006)	Web Application Security (MCA-CS-006)	Automated Testing Using Selenium. (MCA-FSD-006)	Logistics (MCA-MC-006)	Digital Character Animation (MCA-MM-006)
	General	IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
Elective-VI	Multimedia Basics (MCA-DS-318)	Sensors, Actuators and Signal Processing (MCA-IOT-005)	SQL for Data Science (MCA-DaS-005)	Applications of Blockchain-Cryptocurrencies (MCA-BC-005)	Containerization with Docker (MCA-DO-005)	Advanced Computer Network (MCA-CN-005)	Game Design Fundamentals (MCA-AR-005)
	Software Project Management (MCA-DS-319)	Data Management in IoT (MCA-IOT-006)	Time series Analytics-I (MCA-DaS-006)	Smart Contract Application & Development (MCA-BC-006)	DevOps Process Simulation (MCA-DS-006)	Network Management (MCA-CN-006)	Immersive Technology and Media (AR/VR) (MCA-AR-006)

Semester-IV

Course Type	Course Name	Course Code	L	T	P	Total	Int marks	Ext marks	Total	Duration of Exam	Credits	
Core	Introduction to .NET	MCA-DS-410	3			3	100	100	200	3	3	
Core	Advanced Java	MCA-DS-411	3			3	100	100	200	3	3	
Core	Introduction to .NET Lab	MCA-DS-460		4		4	50	50	100	2	2	
Core	Advanced Java Lab	MCA-DS-461		2		2	50	50	100	2	1	
Domain Elective	Elective-VII		2			2	100	100	200	3	2	
Domain Elective	Elective-VIII		2			2	100	100	200	3	2	
Core	Project	MCA-DS-462			10		300	200	500	2	5	
OR												
Core	Major Project	MCA-DS-463	20-22 Week Industrial Training					600	300	900	-	18
Total Credits											18	

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
Elective-VII	Digital Image Processing (MCA-DS-412)	Cloud Security Management (MCA-CC-007)	Neural Networks and Deep Learning (MCA-AI-007)	Cyber Laws (MCA-CS-007)	React JS (MCA-FSD-007)	Ambient Assisted Living/Mobile Health (MCA-MC-007)	Multimedia in Media Production (MCA-MM-007)
	Software API processes (MCA-DS-413)	Ethics and standard of cloud. (MCA-CC-008)	Machine Learning and Pattern Recognition (MCA-AI-008)	Information Security and Research (MCA-CS-008)	Cloud Security (MCA-FSD-008)	Mobile Infotainment (MCA-MC-008)	Multimedia Security (MCA-MM-008)
		IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
Elective-VIII	Decision Support System (MCA-DS-414)	IoT Security Management (MCA-IOT-007)	Statistical methods in Decision making (MCA-DaS-007)	Spring framework (MCA-BC-007)	Web Application on Cloud (MCA-DO-007)	Next Generation Networking. (MCA-CN-007)	Virtual Reality: Interface, Application and Design (MCA-AR-007)
	Simulation Modelling (MCA-DS-415)	IoT Applications (MCA-IOT-008)	Time series Analytics-II (MCA-DaS-008)	Introduction to cryptography (MCA-BC-008)	DevOps Project Management (MCA-DO-008)	Wireless Networking (MCA-CN-008)	Interactive Application Development. (MCA-AR-008)

Note: For Successful completion of the MCA degree, the students need to earn the credits as per the following:

- (a) For Major Project : 64 credits of compulsory courses and at least 16 of Elective Courses.**
- (b) For Semester Option: 60 credits of compulsory courses and at least 20 of Elective Courses**

SEMESTER-I

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-RIC-I: RESEARCH INNOVATION CATALYST-I

Periods/week Credits
T: 1 0.5

Max. Marks: 50
Continuous Evaluation: 50
End Semester Examination: Nil

Pre-requisites: Basic knowledge of Research and Innovation

Course Type: Research & Training

Course Outcomes:

MCA-RIC.I.1. The students will be able to understand what is Research and Innovation.

MCA-RIC.I.2. To be in a position to describe the process and the procedure to carry out research/ innovation

MCA-RIC.I.3. To understand the research documentation that is needed for, journals publication, conferences etc.

MCA-RIC.I.4. To understand and adopt the ethical practice in the research / Innovation activities.

MCA-RIC.I.5. To comprehend the benefits obtained by means of systematic research/ Innovation

MCA-RIC.I.6. To inculcate Team building and collaborative approach.

Unit 1: What is Research?

- 1.1 Capturing the current research/ Innovation trends
- 1.2 Insight about scientific research/ Innovation performed by renowned experts in the related field.
- 1.3 Exploration and excavation of in-house and commercially available facilities
- 1.4 Model design about framing the research/ Innovation question – A motivational Approach
- 1.5 Do's and Don'ts pertaining to research/ Innovation

Unit 2: Insight about Scientific Documentation

- 2.1 Different types of Journals/Conferences
- 2.2 Different components of a research paper
- 2.3 Indexing of Journals
- 2.4 Parameters involved in publication
- 2.5 Scientific/technical writing and ethical practice

Unit 3: Understanding the Literature Survey (LS)

- 3.1 Finding research papers related to a topic
- 3.2 Understanding the different aspects of Literature search and Databases.
- 3.3 Usage of different sources like Google scholar, WoS, PubMed, Scopus, ABDC, EBSCO etc.
- 3.4 Exploration of online library-Deepdyve for research/ Innovation.
- 3.5 Usage of scholarly networking sites like Research Gate, Mendeley, Academia.edu etc.
- 3.6 Demo sessions on the usage of above mentioned sources

Unit 4: Implementation of Process

- 4.1 Understanding and selection of the research/ Innovation theme.
- 4.2 Finding out the specific research/ Innovation problem in the relevant area
- 4.3 Seeking information through published work w.r.t the problem
- 4.4 Reading & categorizing the downloaded/referred papers or articles and structuring of the idea.

Unit 5: Report Writing and Presentation skill Development

- 5.1 Report making on the surveyed literature to cater the basic idea of the author/ inventor
- 5.2 Compiling and analyzing the published results to justify and understand the proposed ideas
- 5.3 Usage of MS-PowerPoint and other technical resources for the presentation
- 5.4 Development of presentation skills and group addressing

References:

1. <http://nptel.ac.in/courses/121106007/>
2. <http://public.wsu.edu/~taflinge/research.html>

Evaluation Criteria: The following evaluation parameters shall be considered for internal assessment by both research coordinators and faculty coordinator or research mentors:-

Criteria	Evaluation parameters	Weightage (Marks)	
Online and offline Attendance	<ul style="list-style-type: none"> Percentage of classes attended by the students 	3+2	5
Group participation and response of the students to a given task	<ul style="list-style-type: none"> Judge individual student in the group Meeting timelines as per lesson plan 	5 10	15
Selection of research/ Innovation topics and Literature Survey	<ul style="list-style-type: none"> Student interaction with faculty mentors Relevance of the topic Usage of Scientific Literature Databases. e.g., Scopus/ Web of Science/ etc. Scientific/Technical writing Number of relevant papers referred for the given topic 	3 2 1 2 2	10
Presentation and Report Making	<ul style="list-style-type: none"> Report structure and Slide sequence, Contribution of individual group member towards the presentation and report Reference listing Plagiarism/Authenticity of the report 	5 5 5 5	20

Course Articulation Matrix:

CO Statement (XX-300)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-RIC.I.1	√	√	√	√	√	√			√		√		√	√
MCA-RIC.I.2			√	√	√				√				√	√
MCA-RIC.I.3		√		√					√	√			√	√
MCA-RIC.I.4								√					√	√
MCA-RIC.I.5	√					√	√					√	√	√
MCA-RIC.I.6	√	√							√			√	√	√

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-110: LINEAR ALGEBRA AND STATISTICAL TECHNIQUES

Periods/week Credits
L: 4 T: 0 4
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of basic mathematics

Course Type: Fundamentals

Course Outcomes: At the end of the course the student will be able to:

- MCA-DS-110.1. Learn the concepts and methods of Linear Algebra.
- MCA-DS-110.2. Interpret the ability to solve problems using Linear Algebra.
- MCA-DS-110.3. Relate Linear Algebra to other domains of study.
- MCA-DS-110.4. Examine the impact of Skewness and outliers on the various statistical interpretations.
- MCA-DS-110.5. Apply various types of statistical tools & Linear Programming in research & real-time problems.

PART-A

Unit 1: Linear Algebra

- 1.1 Concepts of Groups
- 1.2 Concepts of Ring and Fields
- 1.3 Vector Space
- 1.4 Linear Transformations
- 1.5 Linear Algebra
- 1.6 Matrix of Linear Transformation
- 1.7 Inverse of Matrix
- 1.8 Rank of Matrix

Unit 2: Linear Equations

- 2.1 Solution of System of Linear Equations
- 2.2 Homogeneous Linear Equations
- 2.3 Non-Homogeneous Linear Equations
- 2.4 Consistency theorem.

Unit 3: Eigen Values & Triangularization

- 3.1 Characteristic roots and Vectors
- 3.2 Cayley-Hamilton Theorem
- 3.3 Minimal Polynomial of a Matrix
- 3.4 Orthogonal Matrices
- 3.5 Normal and Unitary Matrices
- 3.6 Diagonalization of a Matrix.

PART-B

Unit 4: Elements of Statistics

- 4.1 Measures of Central Tendency
- 4.2 Measures of Variations Covariance
- 4.3 Correlation and Coefficient of Correlation
- 4.4 Regression
- 4.5 Regression lines
- 4.6 Probability
- 4.7 Binomial Distribution
- 4.8 Poisson Distribution
- 4.9 Normal Distribution
- 4.10 Fitting of Normal distribution to given data

Unit 5: Sampling

- 5.1 Concept of Sampling
- 5.2 Level of Significance
- 5.3 Critical Region
- 5.4 Test of Significance for large Samples
- 5.5 Sampling with small Samples
- 5.6 χ^2 - Distribution

Unit 6: Linear Programming & Transportation

- 6.1 Linear Programming
- 6.2 Graphical Method to solve LPP
- 6.3 Simplex Method
- 6.4 Artificial variables and degeneracy in Simplex Method
- 6.4 Transportation Problems and their optimal basic solutions
- 6.5 Unbalanced Transportation Problems.

Suggested Readings:

1. Babu Ram, 2014, Engineering Mathematics, Volume II, Pearson Education
2. Glyn James, 2010, Advanced Modern Engineering Mathematics, Pearson Education
3. Bruce Cooperstein, 2015, Advanced Linear Algebra, Chapman and Hall Publication.
4. Kaare Brandt Petersen, 2012, Michael Syskind Pedersen, The Matrix Cookbook, Technical University of Denmark.

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-110.1	1		1	2	2		3						3	1
MCA-DS-110.2	1	1	2	3	1		2						3	1
MCA-DS-110.3	1	2	2	1	2								2	1
MCA-DS-110.4	1	1	2	1	1		3						1	2
MCA-DS-110.5	1	1	2	1			2	3					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-111: DATA STRUCTURES

Periods/week Credits
L: 3 T: 0 3
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic concepts of C Programming

Course Type: Core

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

- MCA-DS-111.1. Describe the concept to evaluate asymptotic performance of algorithms.
- MCA-DS-111.2. Develop skills to design and analyze simple linear and non-linear data structures.
- MCA-DS-111.3. Apply for solving problem like traversing, searching, sorting, insertion and deletion of data.
- MCA-DS-111.4. Demonstrate linear and non-linear data structures in real life problems.
- MCA-DS-111.5 Solve the problems related to File organization, Hashing and Collision Resolution Techniques.

PART-A

UNIT 1: Introduction to Data Structures

- 1.1 Concepts and definitions of basic data structure
- 1.2 Top Down and Bottom up Approaches
- 1.3 Big "O" Notations
- 1.4 Time and Space Complexity of algorithms
- 1.5 Types of data Structures
- 1.6 Concept of Garbage Collection and Memory Allocation
- 1.7 Array: Representation of one and multidimensional arrays in memory
- 1.8 Array Operations
- 1.9 Sparse matrices: representation
- 1.10 Searching Techniques: Linear Search; Binary search
- 1.11 Sorting Techniques: Internal and External Sorting Techniques.

Unit 2: Stacks and Queues

- 2.1 Stacks: Representation
- 2.2 Operations of Stack
- 2.3 Applications of Stack (Tower of hanoi algorithm and evaluation of arithmetic expression)
- 2.4 Queues: Representation
- 2.5 Operations of queue
- 2.6 Types of Queue
- 2.7 Applications of Queue

Unit 3: Introduction to Linked List

- 3.1 Linked List: Representation
- 3.2 Operations of Linear Linked List
- 3.3 Applications of Linear Linked List
- 3.4 Circular Linked List and its operations
- 3.5 Double Linked List and operations

PART-B

Unit 4: Trees

- 4.1 Trees Terminology
- 4.2 Representing a general tree
- 4.3 Types of Tree
- 4.4 Binary Tree: Memory representation
- 4.5 Binary tree Construction
- 4.6 Traversing of Binary Tree

- 4.7 Convert general tree into binary tree
- 4.8 Threaded Binary tree
- 4.9 Binary Search Tree: Searching and inserting in BST; Deleting in a BST; Applications of BST
- 4.10 B tree and its operations
- 4.11 B+ trees
- 4.12 AVL trees and its operations

Unit 5: Graph Theory

- 5.1 Graphs: Terms related with Graphs
- 5.2 Types of Graphs
- 5.3 Sequential and Linked Representation of Graphs
- 5.4 Traversing a Graph: BFS; DFS
- 5.5 Minimum Spanning Tree
- 5.6 Graph Operations
- 5.7 Shortest path Algorithms: Dijkstra’s and Warshall’s Algorithm

Unit 6: File Organization

- 6.1 Introduction to File Organization
- 6.2 File attributes and operations
- 6.3 Fixed and Variable Length Record
- 6.4 Hashing Techniques
- 6.5 Collision Resolution Techniques

Suggested Readings:

1. Seymour Lipschutz, 2014, Data Structures, McGraw Hill
2. Tenenbaum, 2006, Data Structures using C & C++, Prentice-Hall
3. Yashwant Kanetkar, 2008, Data Structures Through C, BPB Publications

Note: Only latest editions of the books are recommended.

Software required/ Weblinks:

Turbo C
https://www.tutorialspoint.com/data_structures_algorithms/index.htm
<http://toolsqa.com/data-structures-tutorial/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
 Sessional tests
 Surprise questions during lectures/Class Performance
 Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-111.1	1	1	2	2	3		3	2					3	3
MCA-DS-111.2	1	1	1	1	1		2	2			3		3	3
MCA-DS-111.3	1	1	1	1	2		2	2			3		2	3
MCA-DS-111.4	1	1	1	1	1		2	1			3		2	2
MCA-DS-111.5	1	1	1	1			2	2					1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-112: OBJECT ORIENTED PROGRAMMING IN JAVA

Periods/week

Credits

Max. Marks: 200

L: 3

3

Continuous Evaluation: 100

Duration of Examination: 3 Hrs

End Semester Examination: 100

Pre-Requisite: Knowledge of C++ Programming

Course Type: Core

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

MCA-DS-112.1. Understand the Object-oriented concepts of modern programming language.

MCA-DS-112.2. Identify classes, objects, functions and relationships among them needed for a specific problem.

MCA-DS-112.3. Use Java in a variety of technologies and on different platforms.

MCA-DS-112.4. Demonstrate the concepts of Polymorphism and Inheritance.

MCA-DS-112.5. Design solutions of basic problems using Object-oriented approach.

MCA-DS-112.6. Develop GUI based application using AWT.

PART-A

UNIT 1: Introduction and Fundamentals of Java

- 1.1 History of Java; Java essentials
- 1.2 Java Virtual Machine
- 1.3 Java Features
- 1.4 Differences between Java and C++
- 1.5 Java and Internet; Java Program Structure
- 1.6 Java Environment
- 1.7 Keywords; Constants and Variables
- 1.8 Primitive Data Types
- 1.9 Type Conversion and Casting; Operators
- 1.10 Decision Making Statements
- 1.11 Repetitive Statements

UNIT 2: Introducing Classes, Arrays and Inheritance

- 2.1 Concepts of Array
- 2.2 One Dimensional Array & Two dimensional Array
- 2.3 Class fundamentals; Method declaration; declaring objects
- 2.4 Constructors: Parameterized Constructors; Constructor Overloading
- 2.5 Static members, this keyword
- 2.6 Garbage Collection
- 2.7 Concepts of Inheritance
- 2.8 Types of Inheritance in Java; deriving classes using extends keyword
- 2.9 Overriding Methods: Super keyword, Final keyword
- 2.10 Abstract Classes; Shadowing vs overriding

UNIT 3: Interfaces and Packages

- 3.1 Interfaces: Defining, extending and implementing interfaces
- 3.2 Accessing interface variables
- 3.3 Introduction to Java API packages
- 3.4 Defining a Package
- 3.5 Package as Access Protection
- 3.6 Importing packages

PART-B

UNIT 4: Exception Handling and Multithreaded programming

- 4.1 Concepts of Exception
- 4.2 Exception Types; checked and Unchecked Exception

- 4.3 Exception handling techniques: try..catch; throw, throws, finally
- 4.4 Multiple catch statements; creating your own exceptions
- 4.5 Concepts of Thread
- 4.6 Creating a thread
- 4.7 Thread Life-Cycle
- 4.8 Thread Priorities
- 4.9 Synchronizing Threads

UNIT 5: Applet Programming and Introduction to Event Handling

- 5.1 Two types of Applets: Applet & Application
- 5.2 Applet Life Cycle
- 5.3 How to run an applet?
- 5.4 Passing parameters to Applet
- 5.5 Introduction to Event Handling
- 5.6 Delegation Event Model, Sources of events, Event Listeners

UNIT 6: AWT and Introduction to JDBC

- 6.1 Introduction to AWT
- 6.2 Components and Containers
- 6.3 AWT Controls
- 6.4 Introduction to JDBC: Load the driver; establish connection; create statement; execute query; iterate result set, transactions

Suggested Readings:

1. Joshua Bloch, 2018, Effective Java, Pearson Education.
2. E Balagurusamy, 2006, Programming with Java, Tata McGraw Hill.
3. Schildt Herbert, 2011, Java: The Complete Reference, Tata McGraw Hill.
4. Bruce Eckel, 2008, Thinking in Java, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/Web links:

JDK 1.8

<https://www.tutorialspoint.com/java/index.htm>

<https://www.javatpoint.com/java-tutorial>

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Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-112.1	2	2		3	1								2	3
MCA-DS-112.2	2	1		3	2									3
MCA-DS-112.3	2	2	1	3				1						3
MCA-DS-112.4	3	3	1	2				1					2	2
MCA-DS-112.5	2	2	1	2				1			3			3
MCA-DS-112.6	3	2	1	2			1							3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-113: PYTHON PROGRAMMING

Periods/week Credits
L: 2 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Programming Languages

Course Type: Core

Course Outcomes: At the end of the course, students will be able to

MCA-DS-113.1. Define the methodology and procedures related to python programming

MCA-DS-113 2. Demonstrate the concepts of control structures in Python.

MCA-DS-113.3. Use Python data structures to solve complex problems.

MCA-DS-113.4. Illustrate the use of various python libraries and functions.

MCA-DS-113.5. Apply the concepts of file handling and regular expression using packages.

PART –A

UNIT 1: Fundamentals of Python with Operators & Data Types

- 1.1 Need of Python Programming
- 1.2 Installation and Working with Python
- 1.3 Variables, Data Types & Keywords
- 1.4 Input-Output, Indentation and comments
- 1.5 Python basic Operators
- 1.6 Declaring and using Numeric data types: int, float, complex
- 1.7 Using string data type and string operations
- 1.8 Defining list and list slicing
- 1.9 Use of Tuple data type
- 1.10 Introduction to Dictionaries

UNIT 2: Python Program Flow Control

- 2.1 Conditional blocks using if, else and Nested If-else
- 2.2 Simple For loops in python
- 2.3 For loop using ranges, string, list and dictionaries
- 2.4 Use of while loops in python
- 2.5 Loop manipulation using pass, continue, break and else
- 2.6 Programming using Python conditional and loops block

Unit 3: Python Strings, List and Dictionary Manipulations

- 3.1 Building blocks of python programs
- 3.2 Understanding string inbuilt methods
- 3.3 List manipulation using inbuilt methods
- 3.4 Tuple manipulation using inbuilt methods
- 3.5 Dictionary manipulation
- 3.6 Programming using string, list and dictionary in build functions

PART-B

UNIT 4: Python Functions, Modules & Packages

- 4.1 Organizing python codes using functions
- 4.2 Organizing python projects into modules
- 4.3 Importing own module as well as external modules
- 4.4 Understanding Packages
- 4.5 Powerful Lambda function in python

4.6 Programming using functions, modules and external packages

UNIT 5: Exception Handling & File Handling

- 5.1 Basics of Exception
- 5.2 Exception Handling
- 5.3 Try, Finally & Except clause
- 5.4 Multiple Except Blocks
- 5.5 Built-in & User Defined Exceptions
- 5.6 Safe guarding file operation using exception handling
- 5.7 Handling and helping developer with error code
- 5.8 Opening & Closing Files
- 5.9 Understanding read functions, read (), readline() and readlines()
- 5.10 Understanding write functions, write () and writelines()
- 5.11 File Positions & Directory Methods

UNIT 6: Graphical User Interfaces

- 6.1 Behavior of terminal based programs and GUI-based programs
- 6.2 Coding simple GUI-based programs & other useful GUI resources.
- 6.3 Using the tkinter Module
- 6.4 Display text with Label Widgets
- 6.5 Organizing Widgets with Frames
- 6.6 Button Widgets and Info Dialog Boxes
- 6.7 Getting Input with Entry Widget & Using Labels as Output Fields
- 6.8 Radio Buttons, Check Buttons.
- 6.9 Simple Graphics and Image Processing: Overview of Turtle Graphics
- 6.10 Two dimensional Shapes, Colors and RGB System, Image Processing.

Suggested Readings:

1. Allen B. Downey, 2015, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press.
2. Charles Dierbach, 2013, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd.
3. Wesley J Chun, 2015, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015.
4. Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, 2016, "Data Structures and Algorithms in Python", 1st Edition, Wiley India Pvt Ltd.
5. Reema Thareja, 2017, "Python Programming using problem solving approach", Oxford University press.
6. Charles R. Severance, 2017, "Python for Everybody: Exploring Data Using Python 3", 1st Edition, Shroff Publishers.

Note: Only latest editions of the books are recommended

Software required/ Web links:

Python 3.6.4

<https://www.tutorialspoint.com/python/index.htm>

<https://www.programiz.com/python-programming/first-program>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%

Class performance	10%
Attendance	10%

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-113.1	3	2	1			2							2	2
MCA-DS-113.2		1		1			1	1	1	2			1	1
MCA-DS-113.3		3							1				1	3
MCA-DS-113.4		3						1					1	3
MCA-DS-113.5		3	3	2	2	1	1	1		1			2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-DS-161: DATA STRUCTURES LAB

Periods/week Credits
P: 2 T: 0 1
Duration of Examination: 3 Hrs

Max. Marks: 100
Continuous Evaluation: 50
End Semester Examination: 50

Co-Requisite: Knowledge of basic C Programming

Course Type: Core

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-161.1 Analyze the asymptotic performance of various algorithms

MCA-DS-161.2 Design and implement various algorithms with use of arrays, records, linked structures, stacks, queues, trees, and graphs

MCA-DS-161.3 Demonstrate different methods for traversing trees.

MCA-DS-161.4 Compare alternative implementations of data structures with respect to performance.

MCA-DS-161.5 Design and develop non-linear data structure like Trees and Graphs.

List of Experiments:

1. Write a program in C to insert a new element in the list.
2. Write a program in C to delete a new element in the list.
3. Write a program in C to find the sum and subtraction of two matrices.
4. Write a program in C to find the product of two matrices.
5. Write a program in C to find the transpose of a matrix.
6. Write a program in C to sort the list using Bubble Sort.
7. Write a program in C to sort the list using Quick Sort.
8. Write a program in C to sort the list using Insertion Sort.
9. Write a program in C to sort the list using Merge Sort.
10. Write a program in C to sort the list using Heap Sort.
11. Write a program in C to search the element using Linear Search
12. Write a program in C to search the element using Binary Search.
13. Write a program in C to perform all operations of stack using array.
14. Write a program in C to perform all operations of queue using array.
15. Write a program in C to perform all operations of stack using Linked List.
16. Write a program in C to perform all operations of queue using Linked List.
17. Write a program in C to perform all operations of circular queue.
18. Write a program in C to perform insertion operation of linked list.
19. Write a program in C to perform deletion operation of linked list.
20. Write a program in C to perform insertion operation of circular linked list.
21. Write a program in C to perform deletion operation of circular linked list.
22. Write a program in C to perform insertion operation of double linked list.
23. Write a program in C to perform deletion operation of double linked list.
24. Write a program in C to perform traversal of the linked list.
25. Write a program in C to perform insertion operation in Binary Tree.
26. Write a program in C to perform deletion operation in Binary Tree.
27. Write a program in C to perform tree traversal methods.
28. Write a program in C to perform insertion and deletion in Binary Search Tree.

Suggested Readings:

1. Seymour Lipschutz, 2014, Data Structures, McGraw Hill
2. Tenenbaum, 2006, Data Structures using C & C++, Prentice-Hall
3. Yashwant Kanetkar, 2008, Data Structures Through C, BPB Publications

Note: Only latest editions of the books are recommended.

Software required/Web links:

Turbo C++

https://www.tutorialspoint.com/data_structures_algorithms

<https://www.includehelp.com/data-structure-tutorial>

Distribution of Continuous Evaluation Table:

Viva-I	30%
Viva-II	30%
File/ Records	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Experiments in lab

File work/Class Performance

Viva (Question and answers in lab)

End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-161.1	1	1	1		2		2						2	3
MCA-DS-161.2	1	1	1				2						3	3
MCA-DS-161.3	1	1	2	2	1		1	2					1	2
MCA-DS-161.4	1	1	2	2	1		2	2				3	2	2
MCA-DS-161.5	1	1	1	1	2		2	3				3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-DS-162: OBJECT ORIENTED PROGRAMMING IN JAVA LAB

Periods/week	Credits	Max. Marks	: 100
P: 2 T: 0	1	Continuous Evaluation	: 50
Duration of Examination: 3 Hrs		End Semester Examination	: 50

Co-Requisite: Knowledge of Java Programming
Course Type: Core

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

- MCA-DS-162.1. Solve basic problems using concepts of object-oriented programming.
- MCA-DS-162.2. Implement solutions to complex problems using Control Structures, string manipulation and functions.
- MCA-DS-162.3. Propose the use of techniques (inheritance, polymorphism) by implementing them in the Java programming language to solve the given problem
- MCA-DS-162.4. Develop a full-fledged responsive GUI Application using Java AWT and event handling framework.

List of Practical :

1. Write a Java Program to find the Area of circle.
2. Write a program to find sum and reverse of three digit number.
3. Write a program to swap two numbers without using third variable.
4. Write a program to find simple interest.
5. Write a program to find list of prime numbers.
6. Write a program to find sequence of n numbers which are divisible by 3 and 5 both.
7. Write a program to find the roots of a Quadratic Equation.
8. Write a program to find the factorial of n Number.
9. Write a program to find the sequence of Fibonacci series up to n terms.
10. Write a program to check whether given number is palindrome or not.
11. Write a program to find HCF of two numbers.
12. Write a Java Program that will display the sum of $1+1/2+1/3+....+1/n$.
13. Write a Java Program that will print the following outputs:

1	1	\$
22	2 2	\$\$
333	3 3 3	\$\$\$
4444	4 4 4 4	\$\$\$\$
55555	5 5 5 5 5	\$\$\$\$\$
4444		
333		
22		
1		

14. Write a Java Program to find product of two matrices.
15. Write a Java Program to find sum and subtraction of two matrices.
16. Write a Java Program to sort the list in ascending Order.
17. Write a Java Program to convert decimal into binary number.
18. Write a Java Program to find largest and smallest of n numbers.
19. Write a java program which shows the application of constructors.
20. Write a java program to find the electricity bill using inheritance. The details are as follow:

Units	Bill Rate
1-100	Rs 2 per unit
101-300	Rs 5 per unit
301-500	Rs 6 per unit
Above 500	Rs 8 per unit

21. Write a java program to find the result sheet of a student using Interfaces. The details are as follow:

Marks	Grade
--------------	--------------

>90 Excellent
>60 and <=90 Good
Below 60 Average

The format of output is as follow:

Marks of subject 1

Marks of Subject 2

Marks of subject 3

Marks obtained

Total Marks

%Age

22. Write a java program which shows importing of classes from other packages.
23. Write a java program which creates threads using the thread class.
24. Write a java program which use try and catch for exception handling.
25. Write a java program which use multiple catch blocks.
26. Write a java program which shows throwing our own exception.
27. Write a program to handle Labels and Buttons using AWT Controls.
28. Write a program to handle Check Boxes using AWT Controls
29. Write a program to handle Lists and Scroll Bars using AWT Controls
30. Make a mini project based on above mentioned list of practical. Suggested mini projects are:
 - a) Java Application World: A Java Application World software where user can use applications developed in Java such as calculator, notepad+, puzzle game, ip finder, word count tool, source code generator, picture puzzle game, tic tac toe game and exam system.
 - b) Connect Globe: It provides a common platform to share the common people experiences, information's and harassments all over the world and people can discuss on any topic created by only registered user. Moreover, he/she can give the advice on any topic or report.

Suggested Readings:

1. Joshua Bloch, 2018, Effective Java, Pearson Education.
2. E Balagurusamy, 2006, Programming with Java, Tata McGraw Hill.
3. Schildt Herbert, 2011, Java: The Complete Reference, Tata McGraw Hill.
4. Bruce Eckel, 2008, Thinking in Java, Pearson Education

Software required/Weblinks :

JDK 1.8

<https://www.tutorialspoint.com/java/index.htm>

<https://www.javatpoint.com/java-tutorial>

Distribution of Continuous Evaluation Table:

Viva-I	30%
Viva-II	30%
File/ Records	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Experiments in lab

File work/Class Performance

Viva (Question and answers in lab)

End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-162.1	3				1	1	2						1	2
MCA-DS-162.2		2	2		2	2	2				2		3	3
MCA-DS-162.3	2	2		1		1	1	1	1		2		2	3
MCA-DS-162.4	2	2				1	1	1	1		1	1	3	

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-163 : PYTHON PROGRAMMING LAB

Periods/week	Credits	Max. Marks : 100
P: 2	1	Continuous Evaluation : 50
Duration of Examination: 2 Hrs		End Semester Examination: 50

Co-Requisite: Knowledge of Programming concepts

Course Type: Core

Course Outcomes: At the end of the course, students will be able to

MCA-DS-163.1. Develop programs using basics of Python.

MCA-DS-163.2. Use Python data structures to solve complex problems.

MCA-DS-163.3. Demonstrate the concepts of control structures in Python.

MCA-DS-163.4. Apply the concepts of file handling and regular expression using packages.

MCA-DS-163.5. Develop applications using python programming language.

List of Practical:

Topics to be covered: Installation and Working with Python, Setting up path & Running Python Scripts, Variables & Data Types, Keywords, Input-Output, Indentation

1. Write a Python program to display the current date and time.
2. Write a Python program which accepts the radius of a circle from the user and compute the area
3. Write a Python program which accepts the user's first and last name and print them in reverse order with a space between them.
4. Write a Python program that accepts an integer (n) and computes the value of $n+nn+nnn$
5. Write a Python program to print the calendar of a given month and year.
6. Write a Python program to calculate number of days between two dates.
Sample dates : (2014, 7, 2), (2014, 7, 11)
Expected output : 9 days
7. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
8. Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user. Hint: how does an even / odd number react differently when divided by 2?

Topics to be covered: Python basic Operators, Declaring and using Numeric data types: int, float complex, Using string data type and string operations, Defining list and list slicing, Use of Tuple data type, Introduction to Dictionaries, Understanding string inbuilt methods, List manipulation using inbuilt methods, Dictionary manipulation, Programming using string, list and dictionary in build functions

9. Write a Python program which accepts a sequence of comma-separated numbers from user and generate a list and a tuple with those numbers.
10. Write a Python program to calculate the sum of three given numbers, if the values are equal then return thrice of their sum.
11. Write a Python program to test whether a passed letter is a vowel or not
12. Take a list, say for example this one:
`a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]`
and write a program that prints out all the elements of the list that are less than 5.

Extras:

- a) Instead of printing the elements one by one, make a new list that has all the elements less than 5 from this list in it and print out this new list.
- b) Write this in one line of Python.
- c) Ask the user for a number and return a list that contains only elements from the original list a that are smaller than that number given by the user.

13. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a divisor is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because $26 / 13$ has no remainder.)
14. Take two lists, say for example these two:
 $a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]$
 $b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13]$
 and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.
15. Ask the user for a string and print out whether this string is a palindrome or not. (A palindrome is a string that reads the same forwards and backwards.)
16. Let's say I give you a list saved in a variable: $a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]$. Write one line of Python that takes this list a and makes a new list that has only the even elements of this list in it.

Topics to be covered: Conditional blocks using if, else and Nested If-else, Simple For loops in python, For loop using ranges, string, list and dictionaries, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block

17. Generate a random number between 1 and 9 (including 1 and 9). Ask the user to guess the number, then tell them whether they guessed too low, too high, or exactly right. (*Hint: remember to use the user input lessons from the very first exercise*)
18. Ask the user for a number and determine whether the number is prime or not. (For those who have forgotten, a prime number is a number that has no divisors.)
19. Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates.
20. Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.
21. Implement a function that takes as input three variables, and returns the largest of the three. Do this without using the Python `max()` function!
22. Make a mini project based on concepts above list of practical. Suggested mini projects are:
 - a) Write a password generator in Python. Be creative with how you generate passwords - strong passwords have a mix of lowercase letters, uppercase letters, numbers, and symbols. The passwords should be random, generating a new password every time the user asks for a new password. Include your run-time code in a main method.
 - b) Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) Remember the rules:
 - Rock beats scissors
 - Scissors beats paper
 - Paper beats rock

Topics to be covered: Basics of Exception, Exception Handling, Except clause, Try, finally clause, User Defined Exceptions, Safe guarding file operation using exception handling, Handling and helping developer with error code, Understanding read functions, `read()`, `readline()` and `readlines()`, Understanding write functions, `write()` and `writelines()`

23. Python program to perform read and write operations on a file.
24. Python program to copy the contents of a file to another file.
25. Python program to count frequency of characters in a given file.
26. Python program to print each line of a file in reverse order.
27. Python program to compute the number of characters, words and lines in a file.
28. Write a program that prompts the user to enter his name. The program then greets the person with his name. But if the person's name is 'Rahul' and exception is thrown and he is asked to quit the program.
29. Write a program that accepts date of birth along with the other personal details of a person. Throw an exception if an invalid date is entered.
30. Write a Regular Expression to represent all 10 digit mobile numbers. Rules: 1. Every number should contains exactly 10 digits. 2. The first digit should be 7 or 8 or 9 Write a Python Program to check whether the given number is valid mobile number or not?

31. A spell checker can be a helpful tool for people who struggle to spell words correctly. In this exercise, you will write a program that reads a file and displays all of the words in it that are misspelled. Misspelled words will be identified by checking each word in the file against a list of known words. Any words in the user's file that do not appear in the list of known words will be reported as spelling mistakes. The user will provide the name of the file to check for spelling mistakes as a command line parameter. Your program should display an appropriate error message if the command line parameter is missing. An error message should also be displayed if your program is unable to open the user's file. Words followed by a comma, period or other punctuation mark are not reported as spelling mistakes. Ignore the capitalization of the words when checking their spelling.

Suggested Readings:

1. Allen B . Downey, Think Python, 2016, How to Think Like a Computer Scientist, Shroff/O'Reilly Publishers
2. Guido van Rossum and Fred L. Drake Jr, 2011, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.
3. Robert Sedge wick, Kevin Wayne, Robert Dondero, 2015, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.
4. Python Programming using problem solving approach, 2019, Reema Thareja, Oxford University Press.

Note: Only latest editions of the books are recommended

Software required/ Web links:

Python 3.6.4

<https://www.tutorialspoint.com/python/index.htm>

<https://www.programiz.com/python-programming/first-program>

Distribution of Continuous Evaluation Table:

Viva-I	30%
Viva-II	30%
File/ Records	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Experiments in lab

File work/Class Performance

Viva (Question and answers in lab)

End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-163.1	3						3						1	2
MCA-DS-163.2	2	3					3						2	3
MCA-DS-163.3			2				3						1	3
MCA-DS-163.4		2	2		2		3						2	1
MCA-DS-163.5	2	2	2		2		3						3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-115: MATLAB

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of basic Programming concepts

Course Type: Domain Elective

Course Outcomes: At the end of the course, students will be able to

- MCA-DS-115.1. To learn features of MATLAB as a programming tool.
- MCA-DS-115.2. To promote new teaching model that will help to develop programming skills and technique to solve mathematical problems.
- MCA-DS-115.3. To understand MATLAB graphic feature and its applications.
- MCA-DS-115.4. Interpret and visualize simple mathematical functions and operations thereon using plots/display
- MCA-DS-115.5. To use MATLAB as a simulation tool.

PART -A

UNIT 1: Introduction to MATLAB

- 1.1 The MATLAB Environment
- 1.2 MATLAB Basics – Variables, Numbers, Operators, Expressions, Input and output.
- 1.3 Working in the Command Window
- 1.4 Vectors, Arrays – Matrices
- 1.5 EXAMPLES OF MATLAB APPLICATIONS

UNIT 2: MATLAB Arrays

- 2.1 Creating a one-dimensional array (vector)
- 2.2 Creating a two-dimensional array (matrix)
- 2.3 Array addressing
- 2.4 Using a colon: in addressing arrays
- 2.5 Adding elements to existing variables
- 2.6 Deleting elements
- 2.7 Strings and strings as variables
- 2.8 Built-in Functions
- 2.9 User defined Functions

UNIT 3: Graphics with MATLAB

- 3.1 Files and File Management – Import/Export
- 3.2 Basic 2D, 3D plots
- 3.3 Plot commands: pplot, fplot
- 3.4 Plots with error bars
- 3.5 Plots with special graphics
- 3.6 Histograms
- 3.7 Polar plots
- 3.8 Plotting multiple plots on the same page

PART-B

UNIT 4: MATLAB Functions

- 4.1 Built-in Function
- 4.2 User defined Function
- 4.3 Creating a function file
- 4.4 Structure of a function file

4.5 Saving a function file

UNIT 5: Programming with MATLAB

- 5.1 Relational and Logical Operators
- 5.2 Conditional Statements, Loops
- 5.3 Switch Case Statement
- 5.4 Break and continue Command
- 5.5 MATLAB Programs – Programming and Debugging.
- 5.6 Applications of MATLAB Programming.

UNIT 6 : Mathematical Computing with MATLAB

- 6.1 Algebraic equations
- 6.2 Basic Symbolic Calculus
- 6.3 Differential equations
- 6.4 Integration
- 6.5 Numerical Techniques and Transforms

Suggested Readings:

1. Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, 2006, "A Guide to MATLAB – for Beginners and Experienced Users", 2nd Ed., Cambridge University Press.
2. Stephen J. Chapman, 2009, "Essentials of MATLAB Programming", 2nd Ed., Cengage Learning.
3. David McMahon, 2007, "MATLAB Demystified", The McGraw-Hill Companies.
4. Holly Moore, 2012, "MATLAB® for Engineers", 3rd Ed., Pearson Education, Inc..
5. David M. Smith, 2010, "Engineering computation with MATLAB", 2nd Ed., Pearson Education, Inc..

Note: Only latest editions of the books are recommended.

Software required/ Web links:

MATLAB 2022a

https://www.mathworks.com/help/matlab/getting-started-with-matlab.html?s_tid=CRUX_lftnav

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessments Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term and examination

COURSE ARTICULATION MATRIX:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
MCA-DS-115.1	2	3	3	3	3	2	3				2	3	3	3
MCA-DS-115.2	3	2	3	2	2	1	2			2	2	3	2	3
MCA-DS-115.3	3	3	3	3	3	1	3		2		2	2	3	3
MCA-DS-115.4	3	2	2	3	1		2		1			3	2	3
MCA-DS-115.5	3	3	3	3	2	1	3	2				3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-116: SOFT PROGRAMMING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs.

Max. Marks : 200

Continuous Evaluation : 100

End Semester Examination : 100

Pre-Requisite: Basic of AI

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-116.1. Learn soft computing techniques and their applications.

MCA-DS-116.2. Analyze various neural network architectures.

MCA-DS-116.3. Define the fuzzy systems.

MCA-DS-116.4. Understand the genetic algorithm concepts and their applications.

MCA-DS-116.5. Identify and select a suitable Soft Computing technology to solve the problem

MCA-DS-116.6. Construct a solution and implement a Soft Computing solution.

PART- A

Unit 1: Introduction:

- 1.1 What is Soft Computing
- 1.2 Difference between Hard and Soft Computing
- 1.3 Computing
- 1.4 Requirement of Soft computing
- 1.5 Major Areas of Soft Computing
- 1.6 Applications of Soft Computing

Unit 2: Neural Networks:

- 2.1 What is Neural Network
- 2.2 Learning rules and various activation functions
- 2.3 Single layer Perceptron
- 2.4 Back Propagation networks
- 2.5 Architecture of Backpropagation (BP)
- 2.6 Networks, Backpropagation Learning,
- 2.7 Variation of Standard
- 2.8 Back propagation Neural Network,
- 2.9 Introduction to Associative Memory,

Unit 3: Fuzzy Systems:

- 3.1 Fuzzy Set theory
- 3.2 Fuzzy versus Crisp set
- 3.3 Fuzzy Relation
- 3.4 Fuzzification
- 3.5 Minmax Composition
- 3.6 Defuzzification Method,
- 3.7 Fuzzy Logic
- 3.8 Fuzzy Rule based systems
- 3.9 Predicate logic
- 3.10 Fuzzy Decision Making

PART-B

Unit 4: Genetic Algorithm:

- 4.1 History of Genetic Algorithms (GA)
- 4.2 Working Principle
- 4.3 Various Encoding methods
- 4.4 Fitness function
- 4.5 GA Operators- Reproduction
- 4.6 Crossover, Mutation
- 4.7 Convergence of GA
- 4.8 Bit wise operation in GA
- 4.9 Multi-level Optimization.

Unit 5: Hybrid Systems:

- 5.1 Sequential Hybrid Systems
- 5.2 Auxiliary Hybrid Systems
- 5.3 Embedded Hybrid Systems
- 5.4 Neuro-Fuzzy Hybrid Systems
- 5.5 Neuro-Genetic Hybrid Systems
- 5.6 Fuzzy-Genetic Hybrid Systems.

Unit 6: Fuzzy Backpropagation Networks:

- 6.1 LR type Fuzzy numbers
- 6.2 Fuzzy Neuron
- 6.3 Fuzzy BP Architecture
- 6.4 Learning in Fuzzy BP
- 6.5 Application of Fuzzy BP Networks

Suggested Readings:

1. S.Rajasekaran, G. A. Vijayalakshami, 2013, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, , PHI.
2. E. Goldberg, 1989, Genetic Algorithms: Search and Optimization, Addison Wesley.
3. Chin Teng Lin, C. S. George Lee, 1996, Neuro-Fuzzy Systems, PHI.

Note: Only latest editions of the books are recommended.

Software required/ Web links:

1. Student can refer Open source Code and material available for example
2. <http://www.iitk.ac.in/kangal/codes.shtml>
3. <http://lancet.mit.edu/ga/dist/galibdoc.pdf>
4. https://books.google.co.in/books?hl=en&lr=&id=W5SAhUqBVYoc&oi=fnd&pg=PR11&d=SOft+computing+course+&ots=et_2Nvjy_4&sig=jDXLrGIeD3zc4QUxvcEvC5FrFY#v=onepage&q=SOft%20computing%20course&f=false

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-116.1	2	1		2			2						3	3
MCA-DS-116.2	1	3	1	1			2						2	2
MCA-DS-116.3	1	2	1	1			2						2	3
MCA-DS-116.4	1	2	2	3	2		1						3	2
MCA-DS-116.5	2	1	1	3	2		2						2	2
MCA-DS-116.6	1	1	1		2	2	2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-CC-001: Azure Fundamentals

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Mark: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: NA

Course Type: Domain Specific

Course Outcomes: At the end of the course the student will be able to:

- MCA-CC-001.1 Be familiar with the general cloud technology concepts
- MCA-CC-001.2 Build knowledge of Azure services and Azure workloads.
- MCA-CC-001.3 Detail knowledge of security and privacy in Azure, Azure pricing and support.
- MCA-CC-001.4 Develop capability to build the application support, and application development

PART- A

Unit 1: Cloud Fundamentals

- 1.1 Introduction to cloud computing
- 1.2 Describe the benefits of using cloud services
- 1.3 Describe cloud service types
- 1.4 Identify appropriate use cases for each cloud service (IaaS, PaaS, SaaS)

Unit 2: Introduction to Azure

- 2.1 Introduction to Azure
- 2.2 Tour of Azure Portal
- 2.3 Create a Virtual Machine
- 2.4 Creating Resources in azure
- 2.5 Configure IIS

Unit 3: Describe Azure architecture and Services

- 3.1 Describe the core architectural components of Azure
- 3.2 Describe Azure compute
- 3.3 networking service
- 3.4 Describe Azure storage services

PART- B

Unit 4: Describe Azure management and governance

- 4.1 Describe Azure identity
- 4.2 Azure access, and security
- 4.3 Azure advanced Threat Protection
- 4.4 Describe features and tools in Azure for governance and compliance
- 4.5 Describe features and tools for managing and deploying Azure resources

Unit 5: Control Azure Resources

- 5.1 Describe monitoring tools in Azure
- 5.2 Principles of resource group
- 5.3 Tagging to resources
- 5.4 Azure policies
- 5.5 Secure resources in azure

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-CC-002: FUNDAMENTALS OF CLOUD COMPUTING

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Data Communication & Networking

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-CC-002.1 Define cloud computing and memorize the different cloud services and deployment models.

MCA-CC-002.2 Describe importance of virtualization along with their respective technology.

MCA-CC-002.3 Use and examine different cloud computing services.

MCA-CC-002.4 Analyze and compare various different cloud computing platforms such as AWS, Microsoft Azure.

MCA-CC-002.5 Design different cloud computing business applications with appropriate security mechanism.

PART -A

UNIT 1: Introduction to Cloud Computing

- 1.1 Definition of Cloud Computing
- 1.2 Origin and Influences
- 1.3 Basic Concepts of Clouds: Virtualization and Abstraction
- 1.4 Cloud Characteristics
- 1.5 Challenges and Risks
- 1.6 Applications of Cloud Computing

UNIT 2: Cloud Computing Architecture

- 2.1 Cloud Models: Deployment models, Service Models
- 2.2 Cloud reference model (Architecture, Infrastructure, Platform, and Software)
- 2.3 Cloud types (Public, Private, Hybrid & Community clouds) with examples
- 2.4 Exploring cloud computing status; Connecting to cloud
- 2.5 Cloud Computing Technologies: Elasticity, Load Balancing
- 2.6 Open Challenges

UNIT 3: Cloud Delivery Models

- 3.1 IaaS (IaaS workloads, Pods, Aggregation & Silos);
- 3.2 PaaS (Application development, Using PaaS application framework)
- 3.3 SaaS (Characteristics, Open SaaS & SOA)
- 3.4 IDaaS
- 3.5 Comparing Cloud Delivery Models
- 3.6 Combining Cloud Delivery Models

PART-B

UNIT 4: Cloud Security and Trust Management

- 4.1 An Introduction to the Idea of Data Security
- 4.2 Cloud Security Threats
- 4.3 The Current State of Data Security in the Cloud CryptDb
- 4.4 Onion Encryption layers and Homomorphic Encryption
- 4.5 Trust, Reputation and Security Management

UNIT 5: Cloud Platforms in Industry

- 5.1 Amazon Web Services
- 5.2 Google AppEngine
- 5.3 Microsoft Azure

5.4 Manjra Soft Aneka
5.5 Hadoop

Unit 6: Cloud Applications

- 6.1 Scientific Applications
- 6.2 Business Applications
- 6.3 Consumer Applications
- 6.4 Third Party Cloud Services
- 6.5 Case Study related to cloud environment

Suggested Readings:

1. B Rajkumar, V Christian and S. Thamarai Selvi, 2013, Mastering Cloud Computing, TMH Education
2. B Sosinky, 2010, Cloud Computing Bible, Wiley
3. K Jamsa, 2012, Cloud Computing: SaaS, Paas, Iaas, Virtualization, Business Models & More, Jones & Bartlett Learning.
4. K Saurabh, 2012, Cloud Computing, Wiley.
5. Erl, 2013, Cloud Computing-Concepts, Technology & Architecture, Pearson Publication.

Note: Only latest editions of the books are recommended.

Web links:

- https://www.tutorialspoint.com/cloud_computing/cloud_computing_evolution.htm
- http://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf
- http://eddiejackson.net/web_documents/The_Definitive_Guide_to_Cloud_Computing.pdf
- <http://ptgmedia.pearsoncmg.com/images/9780133387520/samplepages/0133387526.pdf>
- <http://www.buyya.com/MasteringClouds/ToC-Preface-TMH.pdf>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CC-002.1	2		1	1			2						3	3
MCA-CC-002.2	1	3	1		1		1						2	2
MCA-CC-002.3	1	2	2	2		2	1						2	3
MCA-CC-002.4	1	2	2	2	3	2	1						3	2
MCA-CC-002.5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-AI-001: CONCEPTS OF AI & MACHINE LEARNING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs.

Max. Marks : 200

Continuous Evaluation : 100

End Semester Examination : 100

Pre-Requisite: Basic of computing.

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-AI-001.1 Develop a good understanding of fundamental principles of machine learning.

MCA-AI-001.2 Formulation of a Machine Learning problem.

MCA-AI-001.3 Develop a model using supervised/unsupervised machine learning algorithms for classification/prediction /clustering.

MCA-AI-001.4 Evaluate performance of various machine learning algorithms on various data sets of a domain.

MCA-AI-001.5 Identify and select a suitable Soft Computing technology to solve the problem.

MCA-AI-001.6 Design and Concrete implementations of various machine learning algorithms to solve a given problem using languages such as Python.

PART- A

Unit 1: Introduction:

- 1.1 Foundations and approaches of AI
- 1.2 Problem solving in Artificial Intelligence and current trends
- 1.3 Introduction: Machine learning, Terminologies in machine learning
- 1.4 Types of machine learning: supervised, unsupervised, semi-supervised learning
- 1.5 Discriminative Models: Least Square Regression
- 1.6 Gradient Descent Algorithm, Univariate and Multivariate Linear Regression

Unit 2: Modelling technique:

- 2.1 Prediction Modeling
- 2.2 Probabilistic interpretation, Regularization,
- 2.3 Logistic regression, multi class classification
- 2.4 Support Vector Machines- Large margin classifiers
- 2.5 Nonlinear SVM,
- 2.6 Kernel functions, SMO algorithm

Unit 3: ML Operations

- 3.1 Dimensionality Reduction Subset Selection
- 3.2 Shrinkage Methods
- 3.3 Principle Components Regression Linear Classification
- 3.4 Logistic Regression
- 3.5 Linear Discriminant Analysis Optimization
- 3.6** Classification-Separating Hyperplanes Classification

PART-B

Unit 4: Neural Networks:

- 4.1 Artificial Neural Networks (Early models, Back Propagation, Initialization, Training & Validation) Parameter Estimation (Maximum Likelihood Estimation, Bayesian Parameter Estimation)
- 4.2 Decision Trees Evaluation Measures
- 4.3 Hypothesis Testing Ensemble Methods
- 4.4 Graphical Models

Unit 5: Unsupervised Learning:

- 5.1 Clustering, Gaussian Mixture Models
- 5.2 Spectral Clustering Ensemble Methods Learning Theory
- 5.3 Reinforcement Learning
- 5.4 Dimensionality Reduction
- 5.5 Principal Component Analysis (PCA),

Unit 6: Supervise Learning:

- 6.1 Generative models : Linear Discriminative Analysis,
- 6.2 Naïve Bayes classifier
- 6.3 Decision trees
- 6.4 Ensemble models – Bagging and Boosting.

Suggested Readings:

1. Tom Mitchell, 1997, "Machine Learning", McGraw Hill.
2. E. Alpaydin, 2005, "Introduction to Machine Learning", PHI.
3. Aurolien Geron, 2017, "Hands-On Machine Learning with Scikit-Learn and TensorFlow, Shroff/O'Reilly".
4. Andreas Muller and Sarah Guido, 2016, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly.

Note: Only latest editions of the books are recommended.

Software required/ Web links:

1. https://onlinecourses.nptel.ac.in/noc21_cs85/preview
2. <https://openlearninglibrary.mit.edu/courses/course-v1:MITx+6.036+1T2019/about>
3. <https://www.udacity.com/course/intro-to-machine-learning--ud120>
4. <https://cedar.buffalo.edu/~srihari/CSE574/>
5. <https://www.cs.utoronto.ca/~fidler/teaching/2015/CSC411.html>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AI-001.1	2	1		2			2						3	3
MCA-AI-001.2	1	3	1	1			2						2	2
MCA-AI-001.3	1	2	1	1			2						2	3
MCA-AI-001.4	1	2	2	3	2		1						3	2
MCA-AI-001.5	2	1	1	3	2		2						2	2
MCA-AI-001.6	1	1	1		2	2	2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-AI-002: PROBABILISTIC REASONING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs.

Max. Marks : 200

Continuous Evaluation : 100

End Semester Examination : 100

Pre-Requisite: Python Programming

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-AI-002.1 The basic principles of probability and random variables.

MCA-AI-002.2 The skills of extracting probabilistic models from the data with the help of continuous probability distributions and Gaussian approach.

MCA-AI-002.3 The estimation statistics and decision-making techniques, algorithms which plays vital role in data mining.

MCA-AI-002.4 The Bayesian process of inference in probabilistic reasoning system.

PART- A

Unit 1: Matrix Decomposition and Dimension Reduction Algorithms:

- 1.1 Principal Component Analysis- Population Principal Components
- 1.2 sample principal coefficients
- 1.3 covariance matrix of data set
- 1.4 Dimensionality reduction
- 1.5 Singular value decomposition
- 1.6 Gram Schmidt process

Unit 2: Continuous Distributions and Gaussian Models:

- 2.1 Continuous distributions: normal distribution-MGF
- 2.2 cumulant generating function
- 2.3 skewness kurtosis
- 2.4 exponential distribution-memory less property
- 2.5 Gaussian distribution.

Unit 3: Maximum Likelihood Parameter Estimation:

- 3.1 Maximum likelihood estimate (MLE) - log-likelihood function-Binomial Poisson
- 3.2 Cramer-Rao Lower Bound (CRLB) and applications
- 3.3 minimum variance unbiased estimator (MVUE).

PART-B

Unit 4: Decision Theory

- 4.1 Decision functions, basic concept
- 4.2 The loss functions
- 4.3 minimax, expected utility principle
- 4.4 point estimation and interval estimation
- 4.5 the Neyman-Pearson lemma as a decision theoretic result
- 4.6 mixture models and the EM algorithm.

Unit 5: Bayesian Methods for Inference and Information Theory:

- 5.1 Deriving the likelihood function
- 5.2 Bayes' rule

- 5.3 Statistical tests and Bayesian model comparison
- 5.4 Bit, Surprisal, Entropy, Source coding theorem
- 5.5 Joint entropy, Conditional entropy
- 5.6 Kullback-Leibler divergence.

Unit 6: Markov networks:

- 6.1 Representation (potentials)
- 6.2 Independence and conditional independence
- 6.3 Trees
- 6.4 Boltzmann machines
- 6.5 Conditional Markov random fields
- 6.6 Inference in Markov networks

Suggested Readings:

1. S. C. Gupta, V. K. Kapoor, 2016, "Fundamentals of Mathematical Statistics", S. Chand & Co.
2. Giovanni Parmigiani, Lurdes Inou, 2009, "Decision Theory Principles and Approaches", Wiley Publication.
3. I.T. Jolliffe, 2002, "Principal Component Analysis", Second Edition, Springer publications.
4. Richard Arnold Johnson, Irwin Miller, John E. Freund, 2013, "Probability and Statistics for Engineers", Prentice Hall.
5. B. S. Grewal, 2012, "Higher Engineering Mathematics", Khanna Publishers.

Note: Only latest editions of the books are recommended.

Software required/ Web links:

1. <https://mbb-team.github.io/VBA-toolbox/wiki/Bayesian-modelling-introduction/>
2. <https://www.coursehero.com/sitemap/schools/2655-University-of-Edinburgh/courses/1641949-INFORMATICPMR/#>
3. https://www.webdepot.umontreal.ca/Usagers/perronf/MonDepotPublic/stt2100/Decision_theory.pdfhttps://cse.iitk.ac.in/pages/CS698X.html
4. <http://www.cs.toronto.edu/~yangxu/information-theory-v3.pdf>
5. <http://www.stat.cmu.edu/~larry/=sml/Bayes.pdf>

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Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AI-002.1	2	1		2			2						3	3
MCA-AI-002.2	1	3	1	1			2						2	2
MCA-AI-002.3	1	2	1	1			2						2	3
MCA-AI-002.4	1	2	2	3	2		1						3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-CS-001: NETWORK SECURITY

Periods/week Credits

L:2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 200

Continuous Evaluation: 100

End Semester Examination : 100

Pre-Requisite: Introduction to Network and Security

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-CS-001.1 Analyze the basic concepts of network security.

MCA-CS-001.2 Recognize various security threats, their harm, strategies and tactics to protect the networks.

MCA-CS-001.3 Explore various aspects of network security and access control mechanism.

MCA-CS-001.4 Network Security Policy Design and Implementation.

MCA-CS-001.5 Secure Firewall Configuration and Management.

PART-A

Unit-I: Fundamentals of Network & Protocol

- 1.1 Computer Network and Defense Fundamental
- 1.2 Understanding computer network, Describing OSI and TCP/IP network Model
- 1.3 Comparing OSI and TCP/IP network Models,
- 1.4 Understanding different types of networks,
- 1.5 Describing various network topologies,
- 1.6 Understanding various network components,
- 1.7 Explaining various protocols in TCP/IP protocol stack,
- 1.8 Explaining IP addressing concept,
- 1.9 Understanding Computer Network Defense (CND).

Unit-II: Vulnerabilities, Attacks and Threats

- 2.1 Network Security Threats,
- 2.2 Vulnerabilities, and Attacks,
- 2.3 Understanding threat, attack, and vulnerability,
- 2.4 Discussing network security concerns,
- 2.5 Reasons behind network security concerns,
- 2.6 Effect of network security breach on business continuity,
- 2.7 Understanding different types of network threats,
- 2.8 Understanding different types of network security vulnerabilities,
- 2.9 Understanding different types of network attacks, Describing various network attacks

Unit-III: Network Security & Authentication

- 3.1 Network Security Controls,
- 3.2 Protocols, and Devices,
- 3.3 Understanding fundamental elements of network security,
- 3.4 Explaining network access control mechanism,
- 3.5 Understanding different types of access controls,
- 3.6 Explaining network Authentication, Authorization and Auditing (AAA) mechanism,
- 3.7 Explaining network data encryption mechanism,
- 3.8 Describing Public Key Infrastructure (PKI), Describing various network security protocols,
- 3.9 Describing various network security devices

PART-B

Unit-IV: Security Policies

- 4.1 Network Security Policy Design and Implementation,
- 4.2 Understanding security policy,
- 4.3 Need of security policies,
- 4.4 Describing the hierarchy of security policy,
- 4.5 Describing the characteristics of a good security policy,
- 4.6 Describing typical content of security policy,
- 4.7 Understanding policy statement,
- 4.8 Describing steps for creating and implementing security policy, Designing of security policy.

Unit-V: Firewall and Technologies

- 5.1 Secure Firewall Configuration and Management,
- 5.2 Understanding firewalls,
- 5.3 Understanding firewall security concerns,
- 5.4 Describing various firewall technologies,
- 5.5 Describing firewall topologies,
- 5.6 Appropriate selection of firewall topologies,
- 5.7 Designing and configuring firewall ruleset,
- 5.8 Implementation of firewall policies,
- 5.9 Explaining the deployment and implementation of firewall,
- 5.10 Factors to consider before purchasing any firewall solution.

Unit-VI: VPN

- 6.1 Secure IDS and VPN Configuration and Management,
- 6.2 Understanding different types of intrusions and their indications,
- 6.3 Understanding IDPS, Importance of implementing IDPS,
- 6.4 Describing role of IDPS in network defense,
- 6.5 Describing functions, components, and working of IDPS, Secure VPN Configuration and Management,
- 6.6 Understanding Virtual Private Network (VPN) and its working,
- 6.7 Importance of establishing VPN, Describing various VPN components,
- 6.8 Describing implementation of VPN concentrators and its functions.

Suggested Readings:

- 1. W. Stallings, 2005, Cryptography and Network Security Principles and Practices, Prentice-Hall
- 2. J. Piwprzyk, T. Hardjono, 2003, Fundamentals of Computer Security, Springer
- 3. Roberta Bragg, Mark Rhodes, 2017, Network security, The Complete Reference, Tata McGraw-Hill

Required/ Web links:

[https://www.tutorialspoint.com/ Network security/index.htm](https://www.tutorialspoint.com/Network%20security/index.htm)

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

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Sessional-I	30%
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Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment / Tutorials

Surprise questions during lectures/Class
PerformanceTerm end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CS-001.1	2					1	2	1					3	3
MCA-CS-001.2	1	3	1		3		1						2	2
MCA-CS-001.3			2	2		3	1							
MCA-CS-001.4	1	2					1						1	1
MCA-CS-001.5	2	3	1	3		1	3	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-CS-002: CYBER SECURITY

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: NA

Course Type: Domain Elective

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

MCA-CS-002.1. Understand of basic concept and issues related to Cyber Security.

MCA-CS-002.2. Distinguish various tools used in Cyber Security.

MCA-CS-002.3. Identify various mechanisms to protect themselves from various security threats on the internet.

MCA-CS-002.4. Use security tools to enhance system security.

MCA-CS-002.5. Apply precautionary measures such as firewalls, digital certificates, to stay safe online.

PART-A

UNIT 1: Introduction to cyber security

- 1.1 Cyber Crimes
- 1.2 Types of Cybercrime
- 1.3 Cyberspace and Criminal Behavior
- 1.4 Digital Forensics
- 1.5 Contemporary Crimes
- 1.6 Indian IT ACT 2000

UNIT 2: Web Application Tools

- 2.1 Scanning for web vulnerability
- 2.2 Hyper Text Transfer Protocol utility
- 2.3 Application Inspection Tools
- 2.4 Password Cracking
- 2.5 Brute Force Tools – John the ripper and Hydra

UNIT 3: Network Defense Tools

- 3.1 Working of Firewall
- 3.2 Packet characteristics to filter
- 3.3 Network address translation
- 3.4 Virtual Private Network
- 3.5 Linux Firewall
- 3.6 Windows Firewall

PART-B

UNIT 4: Cryptography

- 4.2 Ciphers and Secret Message
- 4.3 Security Attacks and Services
- 4.3 Mathematical Tools for Cryptography
- 4.4 Theory of Block Cipher Design
- 4.5 Cipher Network Structures

UNIT 5: Digital Signatures, Certificates, and Standards

- 5.1 Digital Signature Standard and Authentication (DSS and DSA)
- 5.2 Public key Infrastructure
- 5.3 Digital Certificates
- 5.4 Basics of Public Key Cryptography Standards (PKCS)
- 5.5 Internet Protocol and Web Security Protocols

UNIT 6: Introduction to Cyber Crime Investigation

- 6.1 Password Cracking
- 6.2 Keyloggers and Spyware
- 6.3 Trojan and backdoors
- 6.4 SQL Injection
- 6.5 Buffer Overflow
- 6.6 Attack on wireless Networks
- 6.7 Website Attacks

Suggested Readings:

1. J. Piwprzyk, T. Hardjono, 2003, Fundamentals of Computer Security, Springer
2. Nina Godbole, Sunit Belpure, 2011, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Publication Wiley
3. Mike Shema, 2014, Anti-Hacker Tool Kit, McGraw Hill
4. W. Stallings, 2005, Cryptography and Network Security Principles and Practices, Prentice-Hall

Note: Only latest editions of the books are recommended.

Software required/ Web links:

https://www.tutorialspoint.com/cyber_security/index.htm

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

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Class performance	10%
Attendance	10%

Assessment Tools:

Assignment / Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CS-002.1	2		1	1			2						3	3
MCA-CS-002.2	1	3	1		1		1						2	2
MCA-CS-002.3			2	2		2	1							
MCA-CS-002.4	1	2					1							
MCA-CS-002.5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

MCA-FSD-001: GAMING TECHNOLOGY - I

Periods/week Credits
L :2 T: 0 2
Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Sem Examination: 100

Pre-requisites: Basic knowledge of computer graphics and gaming

Course Type: Program Elective

Course Outcomes: The students would be able:

MCA-FSD-001.1. To learn Game Essentials, Types of Games, Stages of Design process.

MCA-FSD-001.2. To understand requirements of designing a game.

MCA-FSD-001.3. To learn how a concept turns into a game, and game world

MCA-FSD-001.4. To create a expressive play, characters in the game

MCA-FSD-001.5. To understand what a storytelling is, various components of storytelling

MCA-FSD-001.6. To learn general principles of level design and design issues of online gaming

Unit 1: Games and Video Games

1.1 What Is a Game?

1.2 Conventional Games Versus Video Games,

1.3 Games for Entertainment,

1.4 Serious Games Designing and Developing Games: An Approach to the Task,

1.5 Key Components of Video Games & The Structure of a Video Game

1.6 Stages of the Design Process, Game Design Team Roles, Game Design Documents,

1.7 The Anatomy of a Game Designer

Unit 2: Genres of Game

2.1 What Is a Genre?

2.2 The Classic Game Genres

2.3 Understanding Your Player: Vanden Berghe's Five Domains of Play,

2.4 Demographic Categories, Gamer Dedication,

2.5 The Dangers of Binary Thinking

2.6 Understanding Your Machine: Home Game Consoles, Personal Computers, Portable Devices Other Devices

Unit 3: Game Concepts

3.1 Getting an Idea

3.2 From Idea to Game Concept

3.3 Game Worlds: What Is a Game World?

3.4 The Purposes of a Game World

3.5 The Dimensions of a Game World

3.6 Realism

Unit 4: Creative and Expressive Play

4.1 Self-Defining Play, Creative Play, Other Forms of Expression,

4.2 Game Modifications Character Development: The Goals of Character Design,

4.3 The Relationship Between Player and Avatar,

4.4 Visual Appearances, Character Depth, Audio Design

Unit 5 Storytelling

5.1 Why Put Stories in Games?

5.2 Key Concepts,

5.3 The Storytelling Engine

5.4 Linear Stories, Nonlinear Stories, Granularity,

- 5.5 Mechanisms for Advancing the Plot, Emotional Limits of Interactive Stories,
- 5.6 Scripted Conversations and Dialogue Trees,
- 5.7 When to Write the Story, Other Considerations

Unit 6: General Principles of Level Design

- 6.1 What Is Level Design?
- 6.2 Key Design Principles, Layouts,
- 6.3 Expanding on the Principles of Level Design,
- 6.4 The Level Design Process, Pitfalls of Level Design Design
- 6.5 Issues for Online Gaming: What Are Online Games? Advantages of Online Games,
- 6.6 Disadvantages of Online Games, Design Issues,
- 6.7 Technical Security, Persistent Worlds, Social Problems

Suggested Books:

1. Rob Miles, 2010 Introduction to Programming Through Game Development Using Microsoft XNA Game Studio, Academic Edition, Microsoft Press.
2. Finney, Kenneth C, 2005, Advanced 3D game programming all in one, First edition, Course Technology Press.
3. Michael Chung, 2010, Game Programming Paradigms, Pocket Gems.
4. La Mothe, André, 2002, Tricks of the Windows game programming gurus, Second Edition, Sams Publishing.

Note: Only latest editions of the books are recommended.

Software required/ Web links:

1. <https://developer.mozilla.org/en-US/docs/Games/Tutorials>
2. <https://gamedevacademy.org/how-to-make-a-game/>

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Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
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COURSE ARTICULATION MATRIX:

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
MCA-FSD-001.1	3	2	2	1	2	2	1	1	1	2	2	2	2	1
MCA-FSD-001.2	3	3	2	2	2	2	1	1	2	2	2	2	2	1
MCA-FSD-001.3	3	2	2	2	2	2	2	1	2	2	2	2	2	2
MCA-FSD-001.4	3	3	2	2	2	2	2	1	2	2	2	2	2	3
MCA-FSD-001.5	3	2	2	2	2	2	2	1	1	2	2	2	2	3
MCA-FSD-001.6	3	3	2	3	2	2	2	1	2	3	3	1	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-FSD-002: ADVANCED WEB TECHNOLOGIES

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: Web Development concepts

Course Type: Domain Elective

Course Outcomes: At the end of the course, the students will be able to

MCA-FSD-002.1 Create UI applications using C#

MCA-FSD-002.2 Design and develop secure web applications using asp.net according to industry standards

MCA-FSD-002.3 Define and create custom web services

MCA-FSD-002.4 Apply the concept of Servlet and its life cycle to create web application.

MCA-FSD-002.5 Build Database connection for the web applications.

PART-A

Unit: 1. Introduction to Dot Net and C#

- 1.1 Introduction: Visual Studio, Visual Studio IDE, Development Environment Setup,
- 1.2 .NET Overview, CLR, Assemblies (monolithic vs. component-based applications), Execution Model,
- 1.3 Client-Side vs. Server-Side Programming, Debugging using Visual Studio,
- 1.4 Creating Different types of Projects in Visual Studio(Web, Desktop, Library),
- 1.5 Variables, Constants, Strings, Data Types, Arrays Different Types of Arrays and Operations on Arrays,
- 1.6 Decision statements, Loop statements, Exception Handling using try – catch –finally, Name Space

Unit 2. OOP C#

- 2.1 Classes and Objects Instance Variables, Methods, Constructors, Properties,
- 2.2 Access Specifiers, Static members and methods
- 2.3 Inheritance Levels of Inheritance, Constructor and Inheritance, Polymorphism,
- 2.4 Interfaces, Abstract classes, Delegates, Indexers, Sealed Classes,
- 2.5 Exception handling Collections and Generics Bounded and Unbounded Collections,
- 2.6 Generic Programming, Generic classes, Functions, Constraints on Generic Programming

Unit 3. Databases and C#

- 3.1 File Handling Text Files,
- 3.2 Binary Files, String Processing, Serialization and Deserialization
- 3.3 ADO.Net Connected and Disconnected,
- 3.4 Architecture of ADO. Net, Commands, Datasets, Data Readers, Data Adapters,
- 3.5 Working with Stored Procedures LINQ and the ADO.NET Entity Framework LINQ Introduction,
- 3.6 Mapping Your Data Model to an Object Model, Introducing Query Syntax 08

PART-B

Unit 4. Asp.Net Web Applications

- 4.1 Inheriting an Interface, Windows Forms ,
- 4.3 MsgBox, DialogBox, Handling Mouse and Keyboard Events
- 4.3 Basic Control Programming for following controls , Button , Label, Textbox,Rich Textbox, RadioButton , Checkbox, List Box, Checked List Box,Tree View, Picture Box, Tab Control

Unit 5. Data and State Management in ASP.NET

- 5.1 ASP.NET Websites with Themes
- 5.2 Master Pages, Data Source Controls,
- 5.3 Data Bound Controls,
- 5.4 ASP.NET State Management-Client Side and Server Side. ASP.NET and AJAX 10

Unit 6. Web Services

- 6.1 XML, Web Services Architecture, UDDI, SOAP and its Format,
- 6.2 WSDL, Create and Consuming XML Web Service Simple and Databases,
- 6.3 WCF- Architecture, End Points, Types of Contracts,
- 6.4 Web Applications and Security

Suggested Readings:

1. Ajit Singh, 2022, Advanced Web Technologies 2022, Amazon Digital Services LLC – Kdp
2. A B Nimbalkar, 2017, Advanced Web Technologies, Nirali Prakashan

Web Links:

1. <https://www.scribd.com/document/501648827/Advance-Web-technology>

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Sessional-I	30%
Sessional-II	30%
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Class performance	10%
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MCA-FSD-002.2	1	1	2	3	1		2						3	1
MCA-FSD-002.3	1	2	2	1	2								2	1
MCA-FSD-002.4	1	1	2	1	1		3						1	2
MCA-FSD-002.5	1	1	2	1			2	3					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-MC-001: MOBILE COMPUTING BASICS

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Computer Networks

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

- MCA-MC-001.1 Define the concept of wireless communication & design of various cellular systems.
- MCA-MC-001.2 Describe working principle of wireless LAN and its standards.
- MCA-MC-001.3 Explain various techniques of multiple user access to scarce radio spectrum resources.
- MCA-MC-001.4 Compare different protocols for mobile adhoc networks
- MCA-MC-001.5 Analyze the working of the GPS system and the concept of location-based routing.
- MCA-MC-001.6 Design applications based on emerging technologies like Bluetooth, RFID, WI-MAX and Mobile IP.

PART -A

Unit 1: Introduction to Mobile Computing

- 1.1 Mobile computing features & characteristics
- 1.2 Issues in mobile computing
- 1.3 Novel applications
- 1.4 Limitations and architecture
- 1.5 Cellular concept
- 1.6 Air-interface
- 1.7 Channel structure
- 1.8 Channel allocation in cellular systems
- 1.9 GSM Architecture, GSM entities, call routing in GSM, CDMA
- 1.10 GPRS network architecture, network operations, data services, limitations, applications

Unit 2: Wireless LAN

- 2.1 IEEE 802.11 standards
- 2.2 Wireless LAN advantages and applications
- 2.3 Wireless LAN Architecture
- 2.4 Mobility in Wireless LAN
- 2.5 Security in Wireless LAN
- 2.6 WIFI versus 3G

Unit-3: Wireless Application Protocol (WAP)

- 3.1 Wireless Application Architecture
- 3.2 Wireless Application protocol Stack
- 3.3 Wireless Application environment
- 3.4 Wireless Application push architecture
- 3.5 Wireless Application push framework
- 3.6 Wireless session protocol
- 3.7 Wireless transmission protocol
- 3.8 WAP gateways and Applications

PART -B

Unit 4: Mobile Adhoc Network

- 4.1 Introduction to Adhoc networks
- 4.2 Definition to Adhoc networks
- 4.3 Characteristics to Adhoc networks
- 4.4 Applications to Adhoc networks
- 4.5 Adhoc mobility model: indoor & outdoor models
- 4.6 Security issues in Adhoc networks

Unit 5: Routing Protocols in Reference to Mobile Computing

- 5.1 Routing Protocols
- 5.2 Design issues
- 5.3 Goals & classification
- 5.4 Proactive versus reactive routing
- 5.5 Problems with Message Routing in Wireless Ad-hoc Mobile Networks
- 5.6 Routing scheme based on signal strength
- 5.7 Dynamic State Routing (DSR)
- 5.8 Route Maintenance and Routing error
- 5.9 Fisheye Routing (FSR)
- 5.10 Ad-hoc on Demand Distance Vector (ADDV)

Unit 6: Emerging Technologies & Mobile IP

- 6.1 Bluetooth protocol stack
- 6.2 Bluetooth security
- 6.3 Bluetooth application model
- 6.4 RFID, RFID tags, Application areas
- 6.5 WIMAX Architecture and applications
- 6.6 Mobile IP Goals
- 6.7 Assumptions & requirement agent discovery
- 6.8 Registration
- 6.9 Tunneling
- 6.10 Optimizations
- 6.11 Reverse tunneling

Suggested Readings:

1. Ashoke K Talukder and Roopa R Yavagal, 2006, Mobile Computing-Technology; Applications and Service Creation, Tata McGraw-Hill.
2. Jochen Schiller, 2004, Mobile Communications, Pearson Education.
3. UME Hansmann, Ltthar Merk, Martin-S-Nickous, Thomas Stohe, 2006, Principles of Mobile Computing, Springer International.

Note: Only latest editions of the books are recommended.

Web links:

- https://www.tutorialspoint.com/mobile_computing/mobile_computing_evolution.htm
- https://sgar91.files.wordpress.com/2011/10/mobile_communications_schiller_2e.pdf
- <http://freeofread.com/download/mobile-computing-talukdar/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-MC-001.1	2		1	1			2						3	3
MCA-MC-001.2	1	3	1		1		1						2	2
MCA-MC-001.3	1	2	2	2		2	1						2	3
MCA-MC-001.4	1	2	2	2	3	2	1						3	2
MCA-MC-001.5	2	3	2	2		2	2	1					2	2
MCA-MC-001.6	3	2	2	1		1	2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-MC-002: MOBILE SOFTWARE TECHNOLOGIES

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Java and OS

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-MC-002.1 Install and configure Android application development tools.

MCA-MC-002.2 Design and develop user Interfaces for the Android platform.

MCA-MC-002.3 Save state information across important operating system events.

MCA-MC-002.4 Apply Java programming concepts to Android application development.

MCA-MC-002.5 Design solutions using approaches that integrate ethical, social, legal, and economic responsibilities.

PART -A

Unit 1: Introduction

- 1.1 Introduction to Mobile Computing
- 1.2 Introduction to Android Development Environment
- 1.3 Mobile Software Engineering
- 1.4 Frameworks and Tools
- 1.5 Generic UI Development
- 1.6 Android User

Unit 2: User Interfaces

- 2.1 VUIs and Mobile Apps
- 2.2 Text-to-Speech Techniques
- 2.3 Designing the Right UI
- 2.4 Multichannel and Multimodal UIs
- 2.5 Intents and Services
- 2.6 Android Intents and Services
- 2.7 Characteristics of Mobile Applications

Unit-3: Storing and Retrieving Data

- 3.1 Synchronization and Replication of Mobile Data
- 3.2 Getting the Model Right
- 3.3 Android Storing and Retrieving Data
- 3.4 Working with a Content Provider

PART -B

Unit 4: Communications Via Network and the Web

- 4.1 State Machine
- 4.2 Correct Communications Model
- 4.3 Android Networking and Web
- 4.4 Deciding Scope of an App
- 4.5 Wireless Connectivity and Mobile Apps
- 4.6 Android Telephony

Unit 5: Notifications, Alarms and Graphics

- 5.1 Performance and Memory Management
- 5.2 Android Notifications and Alarms
- 5.3 Performance and Multithreading
- 5.4 Graphics and UI Performance

5.5 Android Graphics

Unit 6: Putting It All Together (as time allows)

- 6.1 Packaging and Deploying
- 6.2 Performance Best Practices
- 6.3 Android Field Service App
- 6.4 Active Transactions
- 6.5 More on Security
- 6.6 Hacking Android

Suggested Readings:

1. Virat V Giri, Sagar Chavan and Ashwin Mane, 2023, Mobile Application Development, Tech Knowledge Publications
2. Michael Burton, 2022, Android App Development, Wiley.
3. UME Hansmann, Ltthar Merk, Martin-S-Nickous, Thomas Stohe, 2006, Principles of Mobile Computing, Springer International.

Note: Only latest editions of the books are recommended.

Web links:

- <https://www.javatpoint.com/android-tutorial>
- <https://www.w3schools.com/appml/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-MC-002.1	2		1	1			2						3	3
MCA-MC-002.2	1	3	1		1		1						2	2
MCA-MC-002.3	1	2	2	2		2	1						2	3
MCA-MC-002.4	1	2	2	2	3	2	1						3	2
MCA-MC-002.5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-MM-001: DIGITAL METHODS I: PHOTOSHOP, ILLUSTRATOR

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of basics of Computer Graphics and Multimedia.

Course Type: Domain Elective

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

MCA-MM-001.1 Develop critical and creative thinking skills and perceptual awareness necessary for understanding and producing designs using specific design programs.

MCA-MM-001.2 Understand and apply media, technology, and processes.

MCA-MM-001.3 Organize the components of a work into a cohesive whole through knowledge of organizational principles of design and art elements.

MCA-MM-001.4 Evaluate a range of subject matter and ideas to communicate intended meaning in designs through innovative methods.

MCA-MM-001.5 Reflect upon and assess the characteristics and merits of their work and perceive connections between digital media and other disciplines.

PART- A

UNIT I: Getting Acquainted with Photoshop

- 1.1 PS environment, Various tools of PS
- 1.2 colour palette,
- 1.3 Basic Image Manipulation - Scanning images, editing their resolution and size
- 1.4 Bitmap and vector images, creating new images, and placing files
- 1.5 Painting Tools, brush tools, pencils, erasers, magic erasers, blending modes,
- 1.6 Brush Settings, brush palette and use the brushes of various sizes, shapes, and tips, along with other features of brushes.

UNIT II: Manipulating Images

- 2.1 Locking layers, linking and stacking layers, creating layer sets, and other important functions in layers
- 2.2 Making Selections- the lasso, marquee, magic wand, and other tools
- 2.3 Filling and Stroking- paint bucket tool, gradient editor, pattern maker, and other filling and stroking tools
- 2.4 Advanced Layers - layer styles, masking layers, creating knockouts
- 2.5 Text - enter, edit, select, and apply effects to text in an image
- 2.6 Using Channels and Masking - channels, masks, spot colours, alpha channels, and channels palette through this mobile.

UNIT III: Excelling Photoshop

- 3.1 Using Adobe Bridge.
- 3.2 Basic Photo Corrections- Retouching, straightening, cropping, and other basic correction techniques.
- 3.3 Retouching and Repairing - clone stamp tool to retouch and repair the damaged images
- 3.4 Creating Links within an Image - use slicing, jumping, and other actions to insert links within an image
- 3.5 Creating Rollover Web Visuals - rollover states, and how to create them
- 3.6 Animating GIF Images for the Web - to create and manipulate GIFs and use vector masks and other tools to edit them.

Part B

UNIT IV: INTRODUCTION TO ILLUSTRATOR

- 4.1 Straight Lines
- 4.2 Using the Pen Tool
- 4.3 Adjusting the Workspace

- 4.4 Arranging Objects Color Fills
- 4.5 Curves Drawing Curves (Pen Tool)
- 4.6 Anchor Points and Direction Points, Default Fill and Stroke

UNIT V

- 5.1 No Smoking Sign, Fill and Stroke
- 5.2 Basic Shape Tools, Grouping Objects Layers Panel
- 5.3 Working with Templates, Live Trace and Live Paint Tracing, Hand-Drawn Images
- 5.4 Coloring Live Paint Objects Brushes Flare Tool
- 5.5 Compound Paths Group Selection Tool
- 5.6 Mask Till You Drop Clipping Masks (Shapes), Blob Brush Tool Eraser Tool Reflect Tool Masking with Type Type Tool Clipping Masks (Editable Type) Filling Text with a Photo Placing Linked Images

UNIT VI: BUILDING YOUR GAME

- 6.1 Blend Tool Blending Options, Wavy Line Blend Blending Lines Reflect Tool Rotate Tool Juggling Colors and Gradients Dashed Lines and Stroke Options
- 6.2 Saving Colors as Swatches Blending Modes C Gradient Tool Saving Gradient Swatches Combining Shapes with the Pathfinder Merging Paths (Pathfinder)
- 6.3 Transparency Options Grouping Objects
- 6.4 Working with Type Text and Character Options Adding a Drop Cap Type on a Path Text Wrap Fill Text with a Pattern Stylin' Effects
- 6.5 Using the Appearance Panel Transparency Blending Modes Drop Shadows Arrowheads Appearance
- 6.6 Graphic Styles Graphic Styles Appearance Panel Multiple Fills Auto-sizing Text Boxes

Suggested Readings:

1. Adobe Photoshop CC Classroom in a Book, 2018, Andrew Faulkner, Conrad Chavez, Pearson.

Note: Only latest editions of the books are recommended.

Weblinks:

<https://www.creativelive.com/class/adobe-illustrator-cc-the-complete-guide-jason-hoppe>

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Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-MM-001.1					1	1	1		1	1	1		1	1
MCA-MM-001.2					1	1	1		1	1	1		1	1
MCA-MM-001.3					1	1	1		1	1	1		1	1
MCA-MM-001.4					1	1	1		1	1	1		1	1
MCA-MM-001.5					1	1	1		1	1	1		1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-MM-002: ANIMATION FUNDAMENTALS

Periods/week Credits
L :2 T: 0 2.0
Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic Knowledge of computers is required

Course Type: Domain Elective

Course Outcomes: Students will be able to –

MCA-MM-002.1. Understand the basic concept of computer graphics, Graphic devices, Graphics APIs, Graphics Pipeline, open source 3D computer graphics software/tools.

MCA-MM-002.2 Describe and identify the concept of Typography, Typesetting, Handwriting & Calligraphy, Graffiti, Architectural lettering.

MCA-MM-002.3. Apply the concept of Color theory, Color wheel, Color systems, page Layout, User interface design

MCA-MM-002.4. Analyze the Blender open source tool to design the Graphics and Animation.

MCA-MM-002.5. Evaluate the GIMP and Movie sandbox open source tool to design the Graphics and Animation.

MCA-MM-002.6. Create different open source tools to design the Graphics and Animation

PART- A

Unit-1: Introduction to Computer Graphics and Animation

- 1.1 Introduction, History of computer graphics
- 1.2 Graphics Design overview, Types of computer graphics
- 1.3 2D & 3D computer graphics, Graphics areas, Graphic devices
- 1.4 Display techniques.
- 1.4 Major applications, Graphics APIs, Graphics Pipeline
- 1.5 Graphics transformation.
- 1.6 Open source 2D & 3D computer graphics software/tools,
- 1.7 2D/3D Graphics Primitives

Unit-2: Introduction to Typography

- 2.1 Introduction to typography, History of Typography
- 2.2 History of computer Typefaces, Typesetting, Type design
- 2.3 The Anatomy of a Typeface, Classifying Types
- 2.4 Type Families
- 2.5 Handwriting & Calligraphy, Graffiti
- 2.6 Architectural lettering, Typography today

Unit -3: Colors, Page Layout

- 3.1 Introduction to Colors
- 3.2 Color theory
- 3.3 Three groups of colors, Color wheel
- 3.4 Color systems
- 3.5 Introduction to polygon filling.
- 3.6 Filling algorithms (Boundary fill, Flood fill & Scan line algorithms)
- 3.6 Introduction to Page Layout, front end versus back end
- 3.7 User interface design
- 3.8 Functionality requirements gathering
- 3.9 Information Architecture
- 3.10 Prototyping, Usability testing

PART- B

Unit -4: Blender

- 4.1 Introduction to Blender
- 4.2 rendering and Animation Basics (Blender Specific)
- 4.3 Installing Blender, Working with Blender
- 4.4 Blender Interface
- 4.5 Basic Blender Commands,
- 4.6 The Blender 3D view: Modeling, Material & Texture and Lights
- 4.7 Working with layers
- 4.8 Rendering, Character modeling
- 4.9 Animation, Blender in the Media
- 4.10 Blender when compared to other 3D Animation software.

Unit -5: GIMP

- 5.1 Introduction to GIMP
- 5.2 Features and capabilities
- 5.3 Basic concepts of GIMP
- 5.4 GIMP user interface,
- 5.5 Layer Groups

Unit- 6: Movie Sandbox

- 6.1 Introduction to Movie sandbox
- 6.2 Minimum system requirements
- 6.3 Movie using Movie sandbox, Nodes
- 6.4 Cameras in Movies sandbox
- 6.5 Recent development, Conclusion, Comparison

Suggested Books:

1. Roland Hess, 2010, Blender Foundations - The essential Guide to learning Blender 2.6, Routledge.
2. Steve Roberts, 2011, Character Animation Fundamentals - Developing skills for 2D and 3D Character animation, Routledge.

Software required / Weblinks:

<http://en.wikipedia.org/wiki/Color>
[http://en.wikipedia.org/wiki/Blender_\(software\)](http://en.wikipedia.org/wiki/Blender_(software))
<http://www.mopi.nl/blogo/>
<http://www.blender.org/blenderorg/blender-foundation/history/>
<http://www.blender.org/BL/>
<http://www.blender.org/development/release-logs/blender-248/>
<http://www.gimp.org/>
<http://www.gimp.org/features/>
<http://www.moviesandbox.net/>
http://wiki.moviesandbox.net/index.php?title=Main_Page

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from Part A and Part B (one from each unit) Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-117: BASICS OF E-COMMERCE

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Internet

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-117. 1: Understand the fundamentals and importance of E-Commerce.

MCA-DS-117.2: Classify trading relationships including Business to Consumer, Business-to-Business, Inter-organization.

MCA-DS-117.3: Interpret the key features of Internet, Intranets and Extranets by demonstrating their relation with each other.

MCA-DS-117.4: Analyze the major security challenges in using and making On-line transactions.

MCA-DS-117.5: Examine the legal issues and Privacy in E-Commerce.

MCA-DS-117..6: Design an embedded system by exploring marketing strategies and using IOT based applications.

PART-A

Unit 1: Introduction to E-Commerce

- 1.1 Introduction to E-Commerce
- 1.2 Main activities of E-Commerce
- 1.3 Goals of E-Commerce
- 1.4 Technical Components of E-Commerce
- 1.5 Advantages and disadvantages of E-Commerce
- 1.6 Scope of E-Commerce
- 1.7 Electronic Commerce Applications
- 1.8 Electronic Commerce and Electronic Business

Unit 2: Evolution of Internet

- 2.1 Domain Names and Internet Organization
- 2.2 Types of Network
- 2.3 Internet Service Provider
- 2.4 World Wide Web
- 2.5 Benefits of creating a Website
- 2.6 Registering a Domain Name
- 2.7 Web promotion
- 2.8 Shopping Bots

Unit 3: Internet Security

- 3.1 Secure Transaction
- 3.2 Computer Monitoring
- 3.3 Privacy on Internet
- 3.4 Corporate Email privacy
- 3.5 Computer Crime(Laws , Types of Crimes)
- 3.6 Threats and Attacks on Computer System
- 3.7 Software Packages for privacy
- 3.8 Hacking
- 3.9 Computer Virus
- 3.10 Encryption and Decryption
- 3.11 Public Key Encryption
- 3.12 Authorization and Authentication
- 3.13 Firewall

PART-B

Unit 4: Internet, Extranet and Electronic Data Exchange

- 4.1 Definition of Internet
- 4.2 Advantages and Disadvantages of the Internet
- 4.3 Component of Internet Information technology structure
- 4.4 Development of Intranet
- 4.5 Extranet and Intranet Difference
- 4.6 Role of Internet in B2B Application
- 4.7 Concepts of EDI and its Limitation
- 4.8 EDI model
- 4.9 Applications of EDI

Unit 5: Planning for E-Commerce and EPS

- 5.1 Introduction
- 5.2 Types of Electronic Payment System
- 5.3 Payment Types
- 5.4 Electronic Cash
- 5.5 Linking objectives to business strategies
- 5.6 Strategies for developing electronic commerce web sites
- 5.7: Case study on Flip Kart, Amazon and Wall Mart

Unit 6: Internet Marketing and E –Governance for India

- 6.1 Concept of online shopping
- 6.2 Internet business
- 6.3 Internet marketing techniques
- 6.4 The E-cycle of Internet marketing
- 6.5 Personalization e-commerce
- 6.6 Indian customer
- 6.7 Service center
- 6.8 Imports
- 6.9 Exports

Suggested Readings:

1. Kamlesh K Bajaj, Debjani Nag, 2005, E-Commerce-Cutting Edge of Business, Tata McGraw Hill.
2. J Christopher Westland, Theodore H K Clark, 2001, Global Electronic Commerce-Theory and case studies, University Press.
3. G.S.V Muthy, 2019, E-Commerce Concepts, Models, Strategies, Himalaya Publications.
4. Chan, 2001, E-Commerce, Fundamentals and Applications, Wiley Publications.

Note: Only latest editions of the books are recommended.

Web Links:

- https://www.tutorialspoint.com/e_commerce
- <https://www.bestcourse4u.com> > What is e-commerce
- <https://ecommerceguide.com/guides>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-117.1			1		2	3	1	1	1				1	1
MCA-DS-117.2		1	1		2	2	1			2		1	1	
MCA-DS-117.3		1	1	1	1	2	1		1	1			1	1
MCA-DS-117.4		1			1	2	1			1	2		1	1
MCA-DS-117.5		1	1		1	2	1			1	1		1	
MCA-DS-117.6	1	1			1	2	1	1		1	1	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-118: INTRODUCTION TO OPEN SOURCE SOFTWARE AND OPEN STANDARDS

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 2 Hrs

Max. Marks : 200
Continuous Evaluation: 100
End Semester Examination:100

Prerequisite: Basic knowledge of open-source software and World Wide Web is essential.

Course Outcomes:

MCA-DS-118.1 Gain knowledge of Open Standards including evolution of open standards.

MCA-DS-118.2 Gain knowledge about the standard setters with clear differentiation between De Jure and De facto standard setters.

MCA-DS-118.3 Gain knowledge about the adoption of open standards along with case studies.

MCA-DS-118.4 Gain knowledge of open-source software including operating system LINUX and graphical user interface etc.

MCA-DS-118.5 Gain knowledge about the evolution and benefits of open source and how to contribute to open-source projects.

Part A

Unit-1: Introduction to Standards

- 1.1 Introduction to Standards
- 1.2 Types of Standards: Open Standard, Closed Standard Summary and examples
- 1.3 Evolution of Standards
- 1.4 Life Cycle
- 1.5 Importance of Standards
- 1.6 Benefits of Open Standards

Unit-2: The Standard Setters

- 2.1 Standard Organizations
- 2.2 De Jure standard setters - International Organization for Standardization, International Electro technical Commission, International Telecommunication Union, ASEAN, Bureau of Indian Standards
- 2.3 De Facto Standard Setters -Bluetooth Special Interest group, USB Implementers forum; Testing and certification, Summary
- 2.4 Introduction, Drivers for adoption - Network effects, Lower costs, Impending benefits
- 2.5 Adoption methods and Process - Degree of association, Methods, process
- 2.6 Examples of Open Standards adoption in the world - SCOSTA, Web Standards
- 2.7 Adoption barriers, Early adopters

Unit-3: Adoption of Open Standards

- 3.1 Introduction; Drivers of Adoption
- 3.2 Adoption Methods and Process
- 3.3 Examples of Open Standard Adoptions in the World
- 3.4 Adoption Barriers; Early adopters
- 3.5 Open Standards Case Study 1 - Transfer Account Procedure (TAP)
- 3.6 Open Standards Case Study 2 - Open Document Format (ODF)
- 3.7 Major Principles of Open Standards - Openness, Consensus, Due Process, Open IPR, Open World, Open Access, Open meetings, Ongoing support, Open interfaces, Open use

Part B

Unit 4: Introduction to Open Source

- 4.1 Introduction to Open Source Software
- 4.2 History of Open Source Software
- 4.3 Initiation of Open Source project start
- 4.4 Open Source Software examples: The Origins, The GNU projects

- 4.5 The Operating System GNU/Linux, The Graphical User Interface KDE/GNOME, Apache Web Server, Application Software
- 4.6 Strengths and Advantages of Open Source Software - Network effects, Lower cost, Availability, Maintainability
- 4.7 Drivers for Adoption - Lower cost of ownership, Quality, Innovation reuse, Technical competence; Open Source Software Assessment
- 4.8 Examples of Open Source Adoption in the World, Open Source Challenges

Unit 5: History of Open Source

- 5.1 History, evolution and benefits of Open Source
- 5.2 History of Open Source - Evolution of UNIX
- 5.3 GNU General Public License - Genesis of GNU, Copyleft- All Rights reserved
- 5.4 Benefits of Open Source. Open Source Initiative (OSI)
- 5.5 Open Source definition; Free Software foundation
- 5.6 Open Source development process – Call for Contributions, MythBuster
- 5.7 Brook’s law; Open Source Community
- 5.8 Apache Web Server; Apache Software Foundation (ASF); How to contribute to Open source projects?

Unit-6: Adoption of Open Source

- 6.1 Introduction; Drivers for Open Source adoption
- 6.2 Adoption Methods and Process
- 6.3 Examples of Open Standard Adoptions in the World
- 6.4 Open Source Challenges; Introduction
- 6.5 Open Standards Case Study 1 - Mozilla
- 6.6 Open Standards Case Study 2 – Linux

Suggested Books:

- 1. Huibert Vries, Henk Vries , Ilan Oshri, 2008, Standards-Battles in Open Source Software, Springer.

Weblinks:

- 1. <http://www.oasis-open.org/org>.
- 2. <http://www.odfalliance.org/>
- 2. <http://www.iso.org>.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit) Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-118.1	2	2											3	3
MCA-DS-118.2					1	1	1						2	2
MCA-DS-118.3				2		2							2	3
MCA-DS-118.4	1	2	2		3			3	2		2		3	2
MCA-DS-118.5	2	3	2			2							2	2

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-IOT-001: IOT BASICS AND TECHNOLOGY

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Basics of Electronics & Networking

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

- MCA-IOT-001.1. Interpret the vision of IoT & explain in a concise manner how Internet of Things work
- MCA-IOT-001.2. Understand the basics of IoT networking, communication protocols, & sensor networks
- MCA-IOT-001.3. Use & application of wireless technologies and mobile networks for Internet of Things
- MCA-IOT-001.4. Compare and contrast the use of devices, gateways and data management in IoT
- MCA-IOT-001.5. Interfacing of sensing devices & implementation of IoT using Arduino & Raspberry Pi
- MCA-IOT-001.6. Illustrate the applications of IoT in industrial automation, connected vehicles, fog computing and identify real world design constraints.

PART-A

Unit 1: Introduction to IoT

- 1.1 Definition, characteristics, key applications, evolution, IoT enablers
- 1.2 connectivity layers
- 1.3 addressing & network configurations
- 1.4 Sensors & Actuators
- 1.5 Sensing: Sensors, Features, Types, Classes, Transducers
- 1.6 Actuation: Actuators, Features, Types, Classes

Unit 2: Basics of IoT Networking

- 2.1 IoT components
- 2.2 inter-dependencies,
- 2.3 Convergence of domain
- 2.4 functional components of IoT
- 2.5 IoT implementation
- 2.6 IoT categories
- 2.7 SoA, gateways
- 2.8 key technologies of IoT,
- 2.9 IoT challenges
- 2.10 IoT networking protocols: MQTT, CoAP, XMPP, AMQP

Unit 3: Connectivity Technologies

- 3.1 Introduction, working principles & features of key communication protocols
- 3.2 IEEE 802.15.4 (WPAN)
- 3.3 Zigbee
- 3.4 6LoWPAN
- 3.5 Bluetooth
- 3.6 NFC, RFID
- 3.7 WirelessHART, Z-wave,

PART-B

Unit 4: Sensor Networks

- 4.1 Wireless sensor networks
- 4.2 key features, characteristics,

- 4.3 applications, layers
- 4.4 sensor nodes, features & challenges
- 4.5 Sensor web, routing, object detections & tracking
- 4.6 Stationery & mobile WSN
- 4.7 UAVs & FANETs
- 4.8 Machine-to-Machine communication

Unit 5: Arduino Basics

- 5.1 Overview of microcontrollers & embedded systems
- 5.2 Arduino key features, board types & specifications
- 5.3 Arduino Uno- pin configuration & architecture
- 5.4 Arduino IDE: setup & sketch structures
- 5.5 Operators, control statement, strings, loops, arrays, function libraries
- 5.6 Sample sketches & application examples
- 5.7 Interfacing of various types of sensors & actuators with Arduino board

Unit 6: Introduction to Raspberry Pi & IoT Applications

- 6.1 Raspberry Pi: Key features & specifications,
- 6.2 architecture, board types
- 6.3 Operating system, basic setup of Raspberry Pi
- 6.4 Implementation of IoT with Raspberry Pi, examples
- 6.5 Introduction to SDN, Cloud & Fog computing
- 6.6 Smart Cities, Smart Homes, Connected vehicles, Smart grids
- 6.7 Introduction to Industrial IoT (IIoT)

Suggested Readings:

1. Vijay Madiseti and Arshdeep Bahga, 2014, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT.
2. Pethuru Raj and Anupama C. Raman, 2017, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases",CRC Press.
3. Francis daCosta, 2013, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications.
4. Cuno Pfister, 2011, "Getting Started with the Internet of Things", O'Reilly Media.
5. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, 2014, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press.

Note: Only latest editions of the books are recommended.

Web Links:

- <https://www.edx.org/learn/iot-internet-of-things>
- <https://nptel.ac.in/courses/106105166/#>
- <https://geekflare.com/internet-of-things-iot-learning-resources/>
- https://onlinecourses.nptel.ac.in/noc22_cs53/preview
- <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-IOT-001.1	1		1	1	2		2						2	1
MCA-IOT-001.2	1	1	2	3	1		2						3	2
MCA-IOT-001.3	2	2	1	1	2								2	1
MCA-IOT-001.4	1	2	2	1	1		2						1	2
MCA-IOT-001.5	1	1	2	1			2	3					2	2
MCA-IOT-001.6	1	1	2	1	1		2	2				3	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-IOT-002: HARDWARE ARCHITECTURES

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic concepts of C Programming

Course Type: Domain Elective

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

MCA-IOT-002.1. Learn the functional block diagram of a single bus architecture of a computer.

MCA-IOT-002.2. Describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

MCA-IOT-002.3. Demonstrate assembly language program for specified microprocessor for computing 16-bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).

MCA-IOT-002.4. Categorize & describe the process for Concurrent access to memory and cache coherency in Parallel Processors.

MCA-IOT-002.5. Compare different CPU organizations and instructions and will be able to design a memory module and able to analyze its operation by interfacing with the CPU.

MCA-IOT-002.6. Appraise CPU performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

PART-A

Unit 1: Functional blocks of a computer

1.1 Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.

1.2 Instruction set architecture of a CPU – registers, instruction execution cycle.

1.3 RTL interpretation of instructions, addressing modes, instruction set.

1.4 Case study – instruction sets of some common CPUs.

1.5 Case study –on Intel i-series processors.

1.6 Case study –on mobile processors.

Unit 2: Data representation

2.1 Signed number representation,

2.2 Fixed and floating point representations, character representation.

2.3 Computer arithmetic – integer addition and subtraction,

2.4 Ripple carry adder, carry look-ahead adder, etc.

2.5 Multiplication – shift-and add, both multiplier, carry save multiplier, etc.

2.6 Division restoring and non-restoring techniques, floating point arithmetic.

Unit 3: Microprocessor architecture, CPU control unit and Memory system design

3.1 Introduction to x86 architecture.

3.2 CPU control unit design: hardwired and micro-programmed design approaches.

3.3 Case study – design of a simple hypothetical CPU.

3.4 Memory system design: semiconductor memory technologies,

3.5 Memory organization.

PART-B

Unit 4: Peripheral devices and their characteristics

4.1 Peripheral devices and their characteristics: Input-output subsystems

4.2 Peripheral devices and their characteristics: I/O device interface

4.3 I/O transfers – program controlled,

4.4 Interrupt driven and DMA,

4.5 Privileged and non-privileged instructions, software interrupts and exceptions.

- 4.6 Programs and processes – role of interrupts in process state transitions
- 4.7 I/O device interfaces – SCII, USB.

Unit 5: Pipelining and parallel processing

- 5.1 Pipelining: Basic concepts of pipelining,
- 5.2 Throughput and speedup,
- 5.3 Pipeline hazards.
- 5.2 Parallel Processors: Introduction to parallel processors.
- 5.3 Concurrent access to memory and cache coherency.

Unit 6: Memory organization

- 6.1 Memory organization: Memory interleaving,
- 6.2 Memory organization: concept of hierarchical memory organization
- 6.3 Cache memory, cache size vs. block size,
- 6.4 Mapping functions
- 6.5 Replacement algorithms,
- 6.6 Write policies.

Suggested Books:

1. David A. Patterson and John L. Hennessy, 2013, "Computer Organization and Design: The Hardware/Software Interface", Elsevier.
2. Carl Hamache, 2022, "Computer Organization and Embedded Systems", McGraw Hill Higher Education.
3. John P. Hayes, 1998, "Computer Architecture and Organization", McGraw-Hill.
4. William Stallings, 2016, "Computer Organization and Architecture: Designing for Performance", Pearson Education.

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.edrawsoft.com/article/computer-architecture.html>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- End Semester Examination

Course Articulation Matrix:

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2
MCA-IOT-002.1	2			1						1		2	-	2
MCA-IOT-002.2	3	3			2	1	2			2			2	2
MCA-IOT-002.3		3	3	2				1	1					2
MCA-IOT-002.4	2	3		2		2			1	1		3	2	2
MCA-IOT-002.5	3			2	1	-	2	1	2			3		2
MCA-IOT-002.6	3			2	2			2	2	2	2	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DaS-001: PROBABILITY AND STATISTICS

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of basic mathematics

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

- MCA-DaS-001.1. Learn the language and core concepts of probability theory
- MCA-DaS-001.2. Interpret the ability to solve problems based on basic principles of statistical inference.
- MCA-DaS-001.3. Relate Statistical Techniques in other domains of study.
- MCA-DaS-001.4. Examine the impact of Skewness and outliers on the various statistical interpretations.
- MCA-DaS-001.5. Develop critical reasoning by studying statistical concepts

PART - A

Unit 1: Introduction to Probability

- 1.1 Counting
- 1.2 Random variables,
- 1.3 Distributions
- 1.4 Quartiles
- 1.5 Mean Variance
- 1.6 Types of Probability

Unit 2: Laws of Probability

- 2.1 Sum of all probabilities
- 2.2 Addition of probabilities,
- 2.3 Multiplication of probabilities,
- 2.4 Complementary events

Unit 3: Conditional Probability

- 3.1 Conditional probability,
- 3.2 Bayes' theorem,
- 3.3 Base rate fallacy
- 3.4 Joint distributions,
- 3.5 covariance, correlation, independence
- 3.6 Central limit theorem

PART-B

Unit 4: Elements of Statistics

- 4.1 Measures of Central Tendency
- 4.2 Measures of Variations Covariance
- 4.3 Correlation and Coefficient of Correlation
- 4.4 Regression
- 4.5 Regression lines

Unit 5: Probability Distribution

- 5.1 Basic Concepts of Probability Distributions
- 5.2 Binomial Distribution
- 5.3 Poisson Distribution
- 5.4 Normal Distribution
- 5.5 Fitting of Normal distribution to Data

Unit 6: Sampling and Statistical Test

- 6.1 Concept of Sampling
- 6.2 Level of Significance
- 6.3 Critical Region
- 6.4 Test of Significance for large Samples
- 6.5 Sampling with small Samples
- 6.6 χ^2 - Distribution

Suggested Readings:

1. Babu Ram, 2014, Engineering Mathematics, Volume II, Pearson Education
2. Glyn James, 2010, Advanced Modern Engineering Mathematics, Pearson Education
3. Bruce Cooperstein, 2015, Advanced Linear Algebra, Chapman and Hall Publication.
4. Kaare Brandt Petersen, 2012, Michael Syskind Pedersen, The Matrix Cookbook, Technical University of Denmark.

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-Das-001.1	1		1	1	2		3						2	3
MCA-DaS-001.2	1	1	2	3	1		2						3	3
MCA-DaS-001.3	1	2	0	1	2								3	1
MCA-DaS-001.4	1		2	1	1		3						1	3
MCA-DaS-001.5	1	2		1			2	3					1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)
NAAC 'A' Grade University

MCA-DaS-002: INTRODUCTION TO DATA SCIENCE

Periods/week Credits
L :2 T: 0 2.0

Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic Knowledge of Mathematics and Python

Course Type: Domain Elective

Course Outcomes: Students will be able to –

MCA-Das-002.1 Demonstrate proficiency with statistical analysis of data.

MCA-Das-002.2 Execute statistical analysis with professional statistical software.

MCA-Das-002.3. Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.

MCA-Das-002.4. To build and assess Data science-based models.

PART–A

UNIT 1: Introduction to Data Science

- 1.1 Introduction to Data Science
- 1.2 Understanding Data: Definition and Types
- 1.3 Importance and Applications of Data Science
- 1.4 Key Components of Data Science
- 1.5 Data Science vs. Data Analytics

UNIT 2: Languages of Data Science I

- 2.1 Introduction to Python for Data Science
- 2.2 Packages and APIs for Data Science
- 2.3 Working with Datasets and Models
- 2.4 Popular Data Science Libraries: NumPy, Pandas, and Scikit-learn

UNIT 3: Languages of Data Science II

- 3.1 Introduction to R
- 3.2 Exploring RStudio for Data Science
- 3.3 Data Science Workflow: Jupyter Notebooks and Version Control with Git

PART –B

UNIT 4: Data Exploration and Preprocessing

- 4.1 Understanding Data: Types and Sources
- 4.2 Data Cleaning Techniques: Handling Missing Data, Outliers, and Inconsistencies
- 4.3 Data Transformation and Feature Engineering

UNIT 5: Data Analysis and Modeling

- 5.1 Introduction to Statistical Analysis
- 5.3 Statistical Measures: Central Tendency, Variability, and Correlation
- 5.3 Visualization Techniques and Tools: Matplotlib, Seaborn, and Tableau
- 5.4 Data Visualization Techniques: Plotting, charts, graphs

UNIT 6: Data Ethics and Privacy

- 6.1 Ethical considerations in data science
- 6.2 Privacy issues in data science
- 6.3 Anonymization, data anonymization techniques, and data protection regulation
- 6.4 Introduction to responsible data science practices and guidelines

Suggested Readings:

- 1. Peter Bruce, 2020, Practical Statistics for Data Scientists, 2e: 50+ Essential Concepts Using R and Python, O'Reilly
- 2. Andrew Park, 2020, Data Science for Beginners

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.w3schools.com/datascience/>

<https://www.javatpoint.com/data-science>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DaS-002.1	2	2		3	2		2					1		1
MCA-DaS-002.2	2	1	2	1	1		1						3	2
MCA-DaS-002.3	2		1	1	2							1		2
MCA-DaS-002.4	1	2	2	3	1		2						1	2

MRIR

**MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)**

MCA-BC-001: INTRODUCTION TO BLOCKCHAIN

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 200

Continuous Evaluation : 100

End Semester Examination : 100

Pre-Requisite: Fundamentals of Cybersecurity

Course Type: Domain Elective

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

MCA-BC-001.1. Understand the concepts of Blockchain

MCA-BC-001.2. Get the idea about the Protocols

MCA-BC-001.3. Understand about Hyperledger fabric

MCA-BC-001.4. Implement the blockchain

PART-A

Unit 1: Introduction to Blockchain

1.1 Distributed Ledgers

1.2 Design Primitives

1.3 Security issues

Unit 2: Understanding Blockchain

2.1 Consensus

2.2 Permissions

2.3 Privacy

Unit 3: Protocols in Blockchain

3.1 Consensus protocols

3.2 Proof of Work (PoW)

3.3 Scalability aspects of Blockchain consensus protocols

3.4 Permissioned Blockchains: Design goals

3.5 Consensus protocols for Permissioned Blockchains

PART-B

Unit 4: Hyperledger

4.1 Decomposing the consensus

4.2 Hyperledger fabric components

4.3 Design and Implementation of Hyperledger Fabric

4.4 fabric SDK and Front End

4.5 Hyperledger composer tool

Unit 5: Applications

5.1 Blockchain in Financial Software and Systems (FSS):

(i) Settlements

(ii) KYC

(iii) Capital markets

(iv) Insurance

Unit 5: Applications-II

6.1 Blockchain in trade / supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc. Date and time strings

Suggested Readings:

1. Andreas Antonopoulos, 2017, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Shroff/ O'Reilly.
2. Melanie Swa, 2015, Blockchain, O'Reilly

Note: Only latest editions of the books are recommended.

WebLinks:

<https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
 Sessional tests
 Surprise questions during lectures/Class Performance
 Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-BC-001.1	2		1	2	1		2			1			3	1
MCA-BC-001.2	1			1			3	1		1	2	1	2	
MCA-BC-001.3	2		2		1	1			1		2		2	
MCA-BC-001.4	1		1	2			3	1	3		2		3	2

**MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)**

MCA-BC-002: BLOCK CHAIN IMPLEMENTATION & APPLICATIONS

Periods/week Credits
L: 2 T: 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: Blockchain

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

- MCA-BC-002.1. Contentedly discuss and describe the history, types and applications of Blockchain
- MCA-BC-002.2. Gain familiarity with cryptography and Consensus algorithms.
- MCA-BC-002.3. Create and deploy projects using Web3j.
- MCA-BC-002.4. Implement an ICO on Ethereum and design blockchain based application with Swarm & IPFS.

PART-A

Unit 1: Introduction to Blockchain

- 1.1 Distributed DBMS
- 1.2 Limitations of Distributed DBMS
- 1.3 Introduction to Block chain – History, Definition, Distributed Ledger
- 1.4 Blockchain Categories – Public, Private, Consortium

Unit 2: Blockchain Architecture

- 2.1 Blockchain Network and Nodes, Peer-to-Peer Network
- 2.2 Mining Mechanism
- 2.3 Generic elements of Blockchain
- 2.4 Features of Blockchain
- 2.5 Types of Blockchain.

Unit 3: Blockchain Architecture

- 3.1 Operation of Bitcoin Blockchain
- 3.2 Blockchain Architecture – Block, Hash, Distributer P2P
- 3.3 Structure of Blockchain- Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET)

PART-B

Unit 4: Blockchain Futures System

- 4.1** Project presentation
- 4.2** Futures smart contract: Blockchain
- 4.3 Oracles- Web3j: Setting up the Web3J- Installing web3j
- 4.4 Wallet creation
- 4.5 Java client: The wrapper generator
- 4.6 Initializing web3j- Setting up Ethereum accounts
- 4.7 Deploying the contract Aliases and pre-qualifier

Unit 5: Blockchains in Business and creating

- 5.1 Public versus private and permissioned versus permission less blockchains
- 5.2 Privacy and anonymity in Ethereum-

- 5.2 The Ethereum Enterprise Alliance Blockchain as-a-Service- Initial Coin Offering (ICO)
- 5.3 Project setup for ICO implementation- Token contracts-
- 5.4 Token sale contracts-Contract security and testing the code. Date and time strings

Unit 6: Distributed Storage IPFS and Swarm

- 6.1 Ethereum Virtual Machine- Swarm
- 6.2 IPFS: Installing IPFS
- 6.3 Hosting our frontend: Serving your frontend using IPFS
- 6.4 Serving your frontend using Swarm
- 6.5** IPFS file uploader project: Project setup the web page

Suggested Readings:

1. Imran Bashir, 2018, "Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained", 2nd Edition, Packt Publishing Ltd.
2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, 2018, "Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited.
3. Andreas M. Antonopoulos, 2015, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media Inc.
4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, 2016, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press.

Note: Only latest editions of the books are recommended.

Weblinks

1. <https://www.ibm.com/products/blockchain-platform-hyperledger-fabric>
2. <https://www.oracle.com/in/blockchain/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-BC-002.1	1		1	2	2		3						3	1
MCA-BC-002.2	1	1	2	3	1		2						3	1
MCA-BC-002.3	1	2	2	1	2								2	1
MCA-BC-002.4	1	1	2	1	1		3						1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DO-001: DEVOPS ESSENTIALS

Periods/week Credits

Max. Marks : 200

L: 2 T: 0 P:0

Continuous Evaluation : 100

Duration of Examination: 3 Hrs

End Semester Examination : 100

Pre-Requisite: Knowledge of Linux operating system and command-line interface.

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-DO-001.1. Understand the principles and practices of DevOps and its importance in software development.

MCA-DO-001.2. Demonstrate a thorough understanding of the principles and practices of DevOps and its significance in software development.

MCA-DO-001.3. Develop and implement continuous integration and continuous delivery (CI/CD) pipelines for software development projects.

MCA-DO-001.4. Utilize Jenkins for automation and continuous integration to streamline software development processes.

PART-A

UNIT 1: Introduction to DevOps

1.1 Concept of DevOps and its history

1.2 DevOps Principles

1.3 DevOps Benefits

1.4 DevOps Culture

1.5 Introduction to DevOps Tools

1.6 DevOps Processes

UNIT 2: Source Control Management with Git

2.1 Introduction to Git

2.2 Git Fundamentals

2.3 Git Workflow

2.4 Git Collaboration

2.5 Git Integration

UNIT 3: Continuous Integration & Delivery with Jenkins

3.1 Introduction to continuous integration and its essentials

3.2 Jenkins creating pipelines

3.3 Jenkins and its architecture

3.4 Jenkins tools management

3.5 Introduction to continuous delivery

3.6 Setting up Jenkins for continuous delivery

PART-B

UNIT 4: Infrastructure as Code with Terraform

4.1 Introduction to infrastructure as code

4.2 Understanding Terra form and its features

4.3 Deploying infrastructure with Terraform

4.4 Introduction to configuration management

4.5 Understanding Ansible and its features

4.6 Configuring servers with Ansible

UNIT 5: Containerization with Docker

- 5.1 Introduction to containerization
- 5.2 Understanding Docker and its features
- 5.3 Docket Networking
- 5.4 Docker Swarm
- 5.5 Introduction to Container Orchestration
- 5.6 Understanding Kubernetes and its features

UNIT 6 : Monitoring and Logging

- 6.1 Introduction to monitoring and logging
- 6.2 Understanding monitoring tools such as Prometheus and Grafana
- 6.3 Configuring logging with tools such as ELK stack Logical link Control (LLC)
- 6.4 Understanding cloud services and its role in DevOps
- 6.5 Deploying and managing applications in cloud environment
- 6.6 Understanding the DevOps culture and collaboration
- 6.7 Implementing DevOps culture in organizations

Suggested Readings:

1. Gene Kim, Jez Humble, Patrick Debois, and John Willis, 2016, "The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", Revolution press.
2. Jez Humble and David Farley, 2010, "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation", Addison Welsey.

Note: Only latest editions of the books are recommended.

Weblinks:

- https://www.tutorialspoint.com/devops_tutorials.htm
- <https://www.javatpoint.com/devops>
- <https://azure.microsoft.com/en-in/solutions/devops/tutorial/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DO-001.1	3	1		1	2			1			1		1	
MCA-DO-001.2		3			2							1	2	2
MCA-DO-001.3			3		2					1			2	1
MCA-DO-001.4		3			2						1		1	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DO-002: AWS SERVICES

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Computer Network

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-DO-002.1. Identify and understand the concept of AWS

MCA-DO-002.2. Understand the concept of cloud storage over the traditional storage

MCA-DO-002.3. Analyse the concept of a Virtual private cloud

MCA-DO-002.4. Apply the concept of configuring Auto Scaling for real Application Infrastructure

MCA-DO-002.5. Configure the Relational database services (RDS) and Application Services and identify the Security & Identity Services

PART-A

Unit 1: Introduction and getting started with AWS

- 1.1 Introduction to Cloud Computing
- 1.2 Different AWS projects and services
- 1.3 Setting up of the AWS account
- 1.4 AWS Global Infrastructure and its benefits
- 1.5 EC2 instances, Features of Amazon EC2
- 1.6 Different EC2 Instance purchasing options and placement groups

Unit 2: Amazon EC2 and Simple Storage Services

- 2.1 Amazon AMI
- 2.2 AMI creation, security groups, key pairs
- 2.3 Traditional storage tiers, Disadvantages of traditional storage over cloud
- 2.4 AWS storage options: EBS, S3 & Glacier
- 2.5 AWS Connecting Storage: Snowball & Storage Gateway

Unit 3: Virtual Private Cloud & Direct Connect

- 3.1 Subnet and Subnet Mask
- 3.2 VPC and its benefits
- 3.3 Default and Non-default VPC
- 3.4 Components of VPC
- 3.5 Direct Connect

PART -B

Unit 4: Elastic Load Balancing & Auto Scaling

- 4.1 Components and types of load balancing
- 4.2 Auto scaling and its benefits
- 4.3 Dynamic Scaling
- 4.4 Lifecycle of auto-scaling
- 4.5 Components and policies of auto-scaling

Unit 5: Relational database services (RDS) and Application Services

- 5.1 Introduction to RDS

- 5.2 Different database services of AWS: Amazon RDS, DynamoDB, RedShift, ElastiCache
- 5.3 Configuring the database
- 5.4 Configuring backups
- 5.5 Connecting to Database
- 5.6 AWS Application Services: SQS, SNS, SES
- 5.7 AWS Compute Services: Lambda and Elastic Beanstalk

Unit 6: Security & Identity Services

- 6.1 Benefits, features and components of OpsWorks
- 6.2 Benefits of Chef, Cookbook, Recipes
- 6.3 OpsWorks lifecycle events
- 6.4 Security and identity services
- 6.5 IAM and KMS

Suggested Readings:

1. Mark Wilkins, 2019, Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud Addison-Wesley Professional.
2. Andreas Wittig and Michael Wittig, 2018, Amazon Web Services in Action, Manning.
3. Albert Anthony, 2017, Mastering AWS Security, Packet Publishing.

Note: Only latest editions of the books are recommended.

WebLinks:

1. <https://www.guru99.com/what-is-aws.html>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DO-002.1	1		1	2	2		2						3	1
MCA-DO-002.2	1	1	2	3	1		2						3	1
MCA-DO-002.3	1	2	1	1	2								2	1
MCA-DO-002.4	1	1		1	1		3						1	2
MCA-DO-002.5	1	1	2	1			2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

MCA-CN-001: FUNDAMENTALS OF COMPUTER NETWORKS

Periods/week Credits

L :2 T: 0 2.0

Max. Marks: 200

Continuous Evaluation: 100

End Semester Examination: 100

Duration of Exam: 3 Hrs

Pre-Requisite: Basic Knowledge of Animation is required

Course Type: Domain Elective

Course Outcomes: Students will be able to –

MCA-CN-001.1. Explain basic concepts, OSI reference model, services and role of each layer of OSI model.

MCA-CN-001.2 Describe and assign the IP addresses.

MCA-CN-001.3. Understand the various protocols in Wireless Networking.

MCA-CN-001.4. Design and implement the utilities in TCP/IP Networking.

PART – A

UNIT 1: Introduction to Networking & OSI Model

- 1.1 Why use networks
- 1.2 Types of Networks
- 1.3 How networks are used?
- 1.4 OSI Model
- 1.5 Applying the OSI Model
- 1.6 IEEE Networking Specifications
- 1.7 Transmission Basics
- 1.8 Common Media Characteristics

UNIT 2: TCP/IP and Ethernet Standards

- 2.1 Characteristic of TCP/IP
- 2.2 The TCP/IP Model
- 2.3 IPv4 Addressing
- 2.4 IPv6 Addressing
- 2.1 Assigning IP addresses
- 2.2 Host Name and DNS
- 2.3 Ethernet Standards
- 2.4 Network Hardware: (Switches, Routers, Gateways, Hub, Cables)

UNIT 3: Wide Area Network & Wireless Networking

- 3.1 WAN Essentials
- 3.2 WAN Topologies
- 3.3 Wireless Spectrum
- 3.4 Wireless Transmission
- 3.5 WLAN Architecture
- 3.6 802.11 WLANs
- 3.7 Wireless WANs

PART – B

UNIT 4: Designing and Implementing TCP/IP Networking

- 4.1 Designing TCP/IP based Networks
- 4.2 TCP/IP Mail Services
- 4.3 TCP/IP Utilities

4.4 Implementing TCP/IP in the Command Line

UNIT 5: Virtual Networks and Network Security

- 5.1 Virtual Networks and VLANs
- 5.2 Remote Access
- 5.3 VPNs
- 5.4 Network Security & Security Risks
- 5.5 Encryption
- 5.6 Wireless Network Security

UNIT 6: Troubleshoot Network, Network Protocols and Management

- 6.1 Troubleshooting Methodology
- 6.2 Troubleshooting Tools
- 6.3 Fundamentals of Network Management
- 6.4 Network Protocols
- 6.1 Fault and Performance Management

Suggested Readings:

1. Tamara Dean, 2010, Network+ Guide to Networks, 7th Edition. Course Technology - Cengage Learning
2. Don Anderson, Jay Trodden, 2003, Hyper Transport System Architecture: MindShare, Inc, Addison-Wesely Professional
3. Charles E. Spurgeon, 2014, Ethernet: The Definitive Guide, O'Reilly Media Inc.
4. Jenna Matthews, 2005, Computer Networking: Internet Protocols in Action, John Wiley & Sons
5. Tanenbaum, A.S., 2010, Computer Networks: Prentice Hall

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.javatpoint.com/computer-network-tutorial>

https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CN-001.1	2	2		3	2		2					1		1
MCA-CN-001.2	2	1	2	1	1		1						3	2
MCA-CN-001.3	2		1	1	2							1		2
MCA-CN-001.4	1	2	2	3	1		2						1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-CN-002: ROUTING PROTOCOLS AND ARCHITECTURES

Periods/week Credits
L: 2 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Fundamentals of Computer Networks

Course Type: Domain Specific

Course Outcomes: At the end of the course, students will be able to
MCA-CN-002.1. Learn basics of Network Routing.
MCA-CN-002.2. Understand the concepts of different routing algorithms.
MCA-CN-002.3. Apply different routing protocols over network layer and transport layer.
MCA-CN-002.4. Analyze different routing protocols requires to be configured in real routers along with the framework of the concerned routing algorithms.
MCA-CN-002.5. Understanding next generation routing algorithms in the domain of wireless networking.

PART –A

UNIT 1: Network Routing: Basics and Foundations

- 1.1 An Introduction to Routing Algorithms
- 1.2 Types of routers
- 1.3 Functions of Router
- 1.4 Router architectures
- 1.5 Routing tables
- 1.6 Static Routing and Dynamic Routing

UNIT 2: Routing Algorithms

- 2.1 The Optimality Principle
- 2.2 Unicast & Multicast Routing
- 2.2 Shortest Path Routing
- 2.3 Flooding
- 2.4 Distance Vector Routing & Link State Routing
- 2.5 Hierarchical Routing
- 2.6 Broadcast Routing
- 2.7 Routing for Mobile Hosts
- 2.8 k Shortest Paths Algorithm

Unit 3: Network Layer Routing

- 3.1 The IP Protocol
- 3.2 IP Addresses
- 3.3 Internet Control Protocols
- 3.4 Routing Information Protocol
- 3.5 OSPF-The Interior Gateway Routing Protocol
- 3.6 BGP-The Exterior Gateway Routing Protocol
- 3.7 Internet Multicasting
- 3.8 Mobile IP & IPv6

PART-B

UNIT 4: Internet Transport Protocols

- 4.1 Transmission Control Protocol
- 4.2 User Datagram Protocol
- 4.3 Internet Protocol
- 4.4 TCP Congestion Control

- 4.5 Stream Control Transmission Protocol
- 4.6 Wireless TCP & UDP
- 4.7 Transactional TCP.

UNIT 5: Next Generation Routing

- 5.1 Background of QoS and QoS Routing
- 5.2 QoS Attributes
- 5.3 Traffic Engineering
- 5.4 Extension to Routing Protocols
- 5.5 Multiprotocol Label Switching (MPLS),
- 5.6 Generalized MPLS
- 5.7 MPLS Virtual Private Networks

UNIT 6: Wireless Routing Protocols

- 6.1 Routing in cellular radio mobile communication networks
- 6.2 Packet radio Routing Internet based mobile ad-hoc networking
- 6.3 Wireless Networks Routing Algorithms
- 6.4 Destination sequenced Distance Vector(DSDV)
- 6.5 Dynamic source Routing (DSR)
- 6.6 Ad-hoc On demand Distance Vector(AODV)
- 6.7 Temporarily Ordered Routing algorithm (TORA)

Suggested Readings:

1. B. Forouzan, 2017, Data Communication and Networking, Tata McGraw Hill.
2. A.S. Tanenbaum, 2016, Computer networks, Prentice Hall.
3. Tomasi Wayne, 2007, Introduction to Data Communication & Networking, Pearson Education
4. Uyles Black, 1993, Protocol Standards and Interfaces, Computer networks, Black, Prentice Hall Education

Note: Only latest editions of the books are recommended.

Weblinks:

<https://www.smartzworld.com/notes/computer-network-cn-notes-pdf> <https://www.tutorialspoint.com>
www.tutorialspoint.com/listtutorials/networking/1

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional I	30%
Sessional II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
 Sessional tests
 Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CN-002.1		2		1		1	3						2	1
MCA-CN-002.2	2	2	2				3			1			3	2
MCA-CN-002.3		3		1			2						2	
MCA-CN-002.4	2	3			1		2		1		1		1	2
MCA-CN-002.5	2	1	1		2		3			1				

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-AR-001: AUGMENTED REALITY FOUNDATIONS

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination: 100

Pre-Requisite: Nil

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-AR-001.1. Historical and modern overviews and perspectives of Augmented Reality

MCA-AR-001.2. Understand the technologies, components and hardware needed for AR

MCA-AR-001.3. Implement the AR and hand-on preparation

MCA-AR-001.4. Impart the importance of augmented reality with real-time examples

MCA-AR-001.5. Gain knowledge of software tools required for AR

MCA-AR-001.6. Understand the applications of AR and VR

PART-A

Unit 1: Introduction to Augmented Reality

- 1.1 History of Augmented reality and characteristics
- 1.2 Difference between Augmented Reality and Virtual Reality
- 1.3 AR technological components
- 1.4 Technologies used in AR
- 1.5 Feature Extraction
- 1.6 Hardware components- AR devices
- 1.7 Importance of AR - Real world uses of AR
- 1.8 AR types – Software tools available for AR

Unit 2: Technologies needed for Augmented Reality

- 1.9 Hardware technology
- 1.10 virtual scenes
- 1.11 3D objects
- 1.12 AR components – Display, HMD, Eyeglasses, Contact Lenses
- 1.13 AR powered devices
- 1.14 AR application development drawbacks
- 1.15 Compatibility and Performance
- 1.16 R libraries
- 1.17 Motion tracking, Environmental understanding
- 1.18 Anchors

Unit 3: Technology Integration and Implementation of AR

- 3.1 Technology use and integration in industrial settings
- 3.2 Assistive training
- 3.3 Planning and administration for implementation
- 3.4 AR implications
- 3.5 Practical data – AR labs
- 3.6 Platforms to form AR content
- 3.7 Coordinated utilization of AR applications
- 3.8 Hands-on preparation

PART-B

Unit 4: Augmented Reality and Virtual Reality for Micro Learning

- 4.1 Micro learning techniques
- 4.2 Utilizing VR for learning
- 4.3 VR for Practical online assessment

- 4.4 VR infographics, Virtual case considerations
- 4.5 Utilizing AR for learning, Accessible learning, sensible data
- 4.6 Elevated learner engagement
- 4.7 VR technology – Components, Hardware, applications

Unit 5: Tools for Augmented Reality

- 5.1 Tools available for Augmented Reality and Recognition
- 5.2 Software Tools – Google Poly, Unity
- 5.3 Software approaches-recognition types
- 5.4 Native software solutions – ARKit, ARCore
- 5.5 software development kit
- 5.6 Cloud services

Unit 6: Applications of Augmented Reality

- 6. 1 AR business applications
- 6. 2 weather prediction
- 6. 3 market prediction
- 6. 4 smart cities
- 6. 5 AR application for Education
- 6. 6 AR application for Healthcare sector, Agriculture, Civil Engineering, Architecture, Archaeology, Crime and Security, Games, IoT
- 6. 7 Use cases- Social Media, Gaming, Education, Healthcare, Shopping and Business

Suggested Readings:

1. Schmalstieg D, and Hollerer T.,2016, Augmented Reality: Principles & Practice, Pearson Education India.
2. Coiffet, P., Burdea, G. C., 2003, "Virtual Reality Technology," Wiley-IEEE Press.
3. Kaliraj, P., Devi, T., 2021, Innovating with Augmented Reality: Applications in Education and Industry, CRC Press, Taylor & Francis Group, Boca Raton.
4. Craig, A. B.,2013, "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann.

Note: Only latest editions of the books are recommended.

Web Links:

- <https://gamedevacademy.org/best-ar-tutorials/>
- <https://www.geeksforgeeks.org/basics-augmented-reality/>
- <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/all-about-augmented-reality>
- <https://www.youtube.com/watch?v=WzfDo2Wpxks>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AR-001.1	2	2		3	2		2					1		1
MCA-AR-001.2	2	1	2	1	1		1						3	2
MCA-AR-001.3	2		1	1	2							1		2
MCA-AR-001.4	1	2	2	3	1		2						1	2
MCA-AR-001.5		1	2	1			2	3				1	2	3
MCA-AR-001.6	1	1	1	1	1		2	2				2	1	1

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NAAC 'A' Grade University

MCA-AR-002: ANIMATION & RENDERING TECHNIQUES

Periods/week Credits
L :2 T: 0 2.0

Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic Knowledge of Animation is required

Course Type: Domain Elective

Course Outcomes: Students will be able to –

- MCA-AR-002.1. Understand the basic concept of computer graphics, Graphic devices, Graphics APIs, Graphics Pipeline, open-source 3D computer graphics software/tools.
- MCA-AR-002.2 Describe and identify the concept of Character setup.
- MCA-AR-002.3. Apply the concept of 3D Muscle system in Animation
- MCA-AR-002.4. Analyze the Surfacing concept and its practical usage in Animation.
- MCA-AR-002.5. Evaluate the role of 3D Lighting to design the Graphics and Animation.
- MCA-AR-002.6. Create different Animations using different tools and Rendering

PART- A

Unit-1: Introduction to Computer Graphics and Animation

- 1.1 Introduction, History of computer graphics
- 1.2 Graphics Design overview, Types of computer graphics
- 1.3 2D & 3D computer graphics, Graphics areas, Graphic devices
- 1.4 Display techniques.
- 1.4 Major applications, Graphics APIs, Graphics Pipeline
- 1.5 Graphics transformation.
- 1.6 Open source 2D & 3D computer graphics software/tools,
- 1.7 2D/3D Graphics Primitives

Unit-2: Introduction to Character setup

- 2.1 Riggers role & Criteria for a good rig
- 2.2 Joints and skeletons, Creating skeleton hierarchy, Constraints
- 2.3 Forward (FK) and Inverse kinematics (IK), FK, IK joint structures
- 2.4 Animation controllers, Blend shapes, Clusters, Biped Rig- Analyzing reference
- 2.5 Anatomy of human body, Bone placements, Setting up Torso, Biped Arms, Fingers, Legs/Foot controls, Skinning,
- 2.6 Facial Rig- Anatomy of a face, The Facial Action Coding System(FACS), Mouth shapes, Phonemes, Animation controllers for Face, Character GUI.

Unit-3: Introduction to 3D Muscle system

- 3.1 Components of Muscle, Capsules, Spline based muscle system,
- 3.2 Stretch based muscle systems, Muscle Objects and skins,
- 3.3 Assigning weights to Muscle skin, Muscle Builder,
- 3.4 Muscle Parameters, Custom muscle systems,
- 3.5 Wrinkles, fold, jiggle, Slide, Collide, Muscle control.

PART- B

Unit -4: Surfacing

- 4.1 Lofting, Surface, Extruded Surface, Planar Surface, Beveled Surface,
- 4.2 Boundary Surface – Combining Techniques
- 4.3 Surface History – Modeling with Deformers
- 4.4 Editing NURBS Surfaces – Using NURBS Surfacing to Create Polygons
- 4.5 Converting NURBS to Polygons Patch Modeling – Using Artisan to Sculpt NURBS.
- 4.6 Modeling with Deformers
- 4.7 Subdivisions Surfaces: The Lattice – Creating a Base Poly Model, Modeling and Animations, Interiors - More complex UV mapping, Programmatic movement.

Unit -5: 3D Lighting

- 5.1 Directional lights
- 5.2 Spot lights,
- 5.3 Types of lights in 3D space,
- 5.4 Light attributes,
- 5.5 3 Point lighting, 2 Point lighting,
- 5.6 Shadows, photo real environmental lighting

Unit- 6: Rendering

- 6.1 3D rendering
- 6.2 Advance lighting effects,
- 6.3 Shading material for objects: Anisotropic, Blinn, Lambert, Pong, Pong E, Layer Shader, Ocean Shader, Hair tube shader, Ramp shader, Shading Map,
- 6.4 Surface shader, Refining shading materials, Mental ray rendering and Toon shade rendering.
- 6.5 IPR rendering, Software, Hardware rendering, Batch rendering,
- 6.6 Creating various output as per the end user requirements and maintaining the resolution.

Suggested Books:

1. Graphics and Animation Tools, IBM ICE Publication.
2. Roland Hess, Blender Foundations - The essential Guide to learning Blender 2.6
3. Steve Roberts, Character Animation Fundamentals - Developing skills for 2D and 3D Character animation.

Software required/Weblinks:

- <http://en.wikipedia.org/wiki/Color>
- [http://en.wikipedia.org/wiki/Blender_\(software\)](http://en.wikipedia.org/wiki/Blender_(software))
- <http://www.mopi.nl/blog/>
- <http://www.blender.org/blenderorg/blender-foundation/history/>
- <http://www.blender.org/BL/>
- <http://www.blender.org/development/release-logs/blender-248/>

Manav Rachna International Institute of Research and Studies
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CDC-511: PLACEMENT COMPETENCY ENHANCEMENT-I

L T P Credits
4 2

Duration of Examination: 2 Hrs

Total Marks: 100

Continuous Evaluation: 50

End Semester Examination: 50

Course Outcomes: At the end of the course,

CDC-511.1: Students will be able to enhance and expand word knowledge by fostering word consciousness.

CDC-511.2: Students will be able to construct simple and complex sentences accurately and develop reading skills & build verbal reasoning skills.

CDC-511.3: Students will be able to enhance their effectiveness and behave professionally

CDC-511.4: Students will be able to enhance their ability to ace interviews,

CDC-511.5: Students will be able to analyze various forms of data and solve complex problems based on arithmetic reasoning.

CDC-511.6: Students will be able to apply short tricks on complex problems of the number system.

PART – A (VERBAL ABILITY)

Unit 1: Communication Accuracy

- 1.1 Relevance of Verbal Ability and preparatory guidelines
- 1.2 Functional Grammar – Subject Verb Agreement
- 1.3 Tenses – Perfect, Simple, Continuous
- 1.4 Common Errors and rectification, Idioms and Phrases
- 1.5 Word Power Building Skills - Root word technique, antonyms, synonyms, verbal analogies

Unit 2: Reading & Writing Skills

- 2.1 Objectives of Reading, Definition & Types of Reading & Importance of Reading
- 2.2 Reading Techniques: SQ3R, Active Reading, Detailed, Speed Reading
- 2.3 Practice Exercises: Short & Medium Passages
- 2.4 Sentences, Phrases, Types of Sentences, Parts of Sentences
- 2.5 Paragraph Writing: Construction, Linkage & Cohesion
- 2.6 Email writing using given phrases

PART – B (INTERVIEW ENHANCEMENT)

Unit 3: Personal Effectiveness

- 3.1 Communication Enhancement
- 3.2 Goal Setting
- 3.3 Professionalism - Integrity, Workplace ethics
- 3.4 Teamwork & Leadership
- 3.5 Time Management

Unit 4: Interview Prep-1

- 4.1 Developing the employability mindset, Researching the employer
- 4.2 Preparing for Self -Introduction
- 4.3 Drafting Cover letters / Emails
- 4.4 Dressing Dos & Don'ts
- 4.5 Acing the interview
- 4.6 Group Discussion
- 4.7 Resume

PART – C (APTITUDE)

Unit 5: Arithmetic

- 5.1 Numbers
- 5.2 Percentages
- 5.3 Profit and Loss
- 5.4 Simple Interest & Compound Interest
- 5.5 Ratio & Proportion
- 5.6 Partnership
- 5.7 Time Speed & Distance

Unit 6: Reasoning

- 6.1 Blood Relation
- 6.2 Coding Decoding
- 6.3 Direction Sense

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under Section 3 of the UGC Act 1956)

MCA-DS-001: Fundamentals of Computer Programming

Periods/week Credits
L: 2 T: 0P :0 Audit Pass
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: None
Course Type: Bridge

Course Outcomes: At the end of the course, students will be able to
MCA-DS-001.1 Understand the structured programming designs and the basic elements of Computer Programming
MCA-DS-001.2 Describe and differentiate various types of Open Source Software
MCA-DS-001.3. Construct program code using simple and nested selection/decision control structure to make decision.
MCA-DS-001.4. Use pre& post tested loop/repetitive control structure while writing program code to process same sequence of tasks/activities.
MCA-DS-001.5. Apply various open source tools for improving development efficiency.

PART - A

UNIT 1: Introduction to Programming

- 1.1 History of Programming,
- 1.2 Difference b/w Programming Languages
- 1.3 System Development Life Cycle
- 1.4 Introduction to OOP
- 1.5 Introduction to Python : Installation, Python IDE
- 1.6 Syntax Rules and Basic Program
- 1.7 Numbers and Math Functions

UNIT 2: Programming Standards

- 2.1 Flow Chart
- 2.2 Pseudo Code and Hierarchy Chart
- 2.3 Syntax Errors
- 2.4 Logical Errors and Runtime Errors
- 2.5 Detailed Working of a Compiler
- 2.6 Difference Between Compiler and Interpreter.

UNIT 3: Programming Controls

- 3.1 Controls and Properties
- 3.2 Variables and Arithmetic Operations
- 3.3 Writing Program that Handle a Control Events
- 3.4 Strings
- 3.5 Data type conversions
- 3.6 Built –in functions

PART - B

UNIT 4: Introduction to Open Source

- 4.1. Why open source, What is Open Source, Open Source Principles
- 4.2. Software License provider, Free Software Vs Open Source Software
- 4.3. Open Source Standards, Methodologies, Philosophy

4.4. Case Studies: Apache, Linux ,Mozilla Firefox

UNIT 5: Open Source Programming Languages

- 5.1. Various Open Source Programming Languages.
- 5.2. Programming Language Case Study: Python, Java, PHP
- 5.3. Open Source vs Closed Source Programming.
- 5.4. Server Side vs Client Side Programming.
- 5.5. Front-End and Back-End

UNIT 6: Open Source Programming Tools

- 6.1. Starting and Maintaining an Open Source Project
- 6.2. Open Source Ethics.
- 6.3. Open Source IDE's and Editors (Eclipse, Atom, Sublime Text).
- 6.4. Source Code Management (Git)
- 6.5. Open Source Project Repositories(GitHub, SourceForge, Google Code etc.)

Suggested Readings:

1. E. Balaguruswami, 2016, Programming in ANSI 'C', Tata McGraw- Hill, 7th Edition
2. Ashok Kamthane, 2006, Programming with ANSI and TURBO C, Pearson
3. Karl Fogel, 2005, Producing Open Source Software, Oreilly Media
4. Mark Pilgrim, 2004, Dive into Python, Apress Publications

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Turbo C

Python 3.x

<https://www.tutorialspoint.com/cprogramming/index.htm>

<https://www.cprogramming.com/tutorial/c-tutorial.html>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1 2	PSO 1	PSO 2
MCA-DS-001.1	1				2	1	3	2	1	-			2	1
MCA-DS-001.2		3	2	1			3			3		1		3
MCA-DS-001.3	1	3	2	2	2				1				2	1
MCA-DS-001.4	2	1		1	2							1	2	2
MCA-DS-001.5	1	1	2		2	1				2			2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-002: ELEMENTS OF MATHEMATICS

Periods/week Credits
L: 2 Audit Pass
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: None

Course Type: Fundamental

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-002.1. Understand the concept of matrices and various operations performed on matrices

MCA-DS-002.2. Learn basic concepts of probability

MCA-DS-002.3. Use different types of functions

MCA-DS-002.4. Develop the concept of Set, Relations and Function

MCA-DS-002.5. Apply mathematics in real life.

PART-A

UNIT 1: Set Theory

- 1.1 Elements of set methods of describing a set
- 1.2 Types of Set
- 1.3 Venn diagram
- 1.4 Difference of a set
- 1.5 Union intersection and difference of set duality and applications
- 1.6 Partitioning of a set

UNIT 2: Relation and Function

- 2.1 Definition of Relation
- 2.2 Application of relation
- 2.3 Definition of function
- 2.4 Cartesian product
- 2.5 Concepts of domain, co-domain and range
- 2.6 Application on domain and range

UNIT 3: Matrices and Determinants

- 3.1 Matrices
- 3.2 Types of matrices
- 3.3 Operation on matrices
- 3.4 Scalar multiplication and multiplication of matrices
- 3.5 Determinant
- 3.6 Inverse of matrices
- 3.7 Cramer's Rule

PART- B

UNIT 4: Binomial and Permutations, Combinations

- 4.1 Definition and basics of binomial theorem
- 4.2 Positive index

- 4.3 Applications of binomial theorem (Only positive index)
- 4.4 Basics of Permutations and Combinations

UNIT5: Co-ordinate Geometry

- 5.1 Quadrant Planes
- 5.2 Distance Formula
- 5.3 Section Formula
- 5.4 Bisection Formula,
- 5.5 Slope
- 5.6 Equations of straight Line
- 5.7 Angle between two lines.

UNIT6: Probability

- 6.1 Basics of Probability
- 6.2 Addition Theorem on Probability
- 6.3 Conditional Probability
- 6.4 Multiplication Theorem on Probability
- 6.5 Independent Events
- 6.6 Baye's Theorem

Suggested Readings:

1. Dr. Babu Ram, 2010, Discrete Mathematics, Pearson Publication
2. Schaum Series ,2007, Discrete Mathematics, Tata McGraw Hill
3. Dr. Delip Kumar,2016, Elements of Mathematics, Jeevan Sons Publications.

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-002.1	1		1	2	2		3						3	1
MCA-DS-002.2	1	1	2	3	1		2						3	1
MCA-DS-002.3	1	2	2	1	2								2	1
MCA-DS-002.4	1	1	2	1	1		3						1	2
MCA-DS-002.5	1	1	2	1			2	3					2	2

SEMESTER-II

MRP

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-RIC-II: Research and Innovation Catalyst-II

Periods/week Credits
T: 1 0.5

Max. Marks : 50
Continuous Evaluation : 50

Pre-requisites: Research and Innovation Catalyst-I

Course Type: Research & Training

Course Outcomes: The students will be able

MCA-RIC-II.1. To critically evaluate the work done by various researchers relevant to the research topic

MCA-RIC-II.2. To integrate the relevant theory and practices followed in a logical way and draw appropriate Conclusions

MCA-RIC-II.3. To understand the research methodologies/approaches/techniques used in research/ Innovation domains

MCA-RIC-II.4. To structure and organize the collected information or findings through an appropriate abstract, headings, reference citations and smooth transitions between sections

MCA-RIC-II.5. To learn the structuring of the paper/ concept in the form of Power Point Presentation

MCA-RIC-II.6. To adapt working with group members and outside world.

Unit 1: Literature Survey (LS)

1.1 Collection of research papers related to previously identified gap/problem

1.2 Comprehend and arrange the literature based on the idea framed

1.3 Presenting the collected data and inferring it with the further scope of expansion

Unit 2: Structuring of Review Paper

2.1 Analysis of different approach/methodology adopted by various researchers

2.2 Listing out the components of the paper w.r.t the problem

2.3 Identification of suitable Journal or Conference

2.4 Formatting/Styling the paper according to the respective template

Unit 3: Presenting the findings

3.1 Structuring and preparation of PPT

3.2 Mock presentation

3.3 Review on presentation skills and content delivered both

3.4 Incorporating the review comments in the slides

References:

1. <http://www.sciencedirect.com/>
2. <https://www.ncbi.nlm.nih.gov/pubmed>
3. <https://www.elsevier.com/books-and-journals>
4. <https://www.plos.org/>
5. <https://www.deepdyve.com/>
6. <http://ieeexplore.ieee.org/Xplore/home.jsp>
7. <https://www.researchgate.net/>
8. <https://www.science.gov/>
9. <https://scholar.google.co.in/>
10. <http://www.popsci.com/>

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-210: DATA COMMUNICATIONS

Periods/week Credits
L: 3 T: 0 P:0
Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Computer Networks

Course Type: Core

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-210.1. Understand the concepts of data communication and data transmission.

MCA-DS-210.2. Define signal and characteristics of signals.

MCA-DS-210.3. Understand the concepts of transmission media in networking

MCA-DS-210.4. To master the terminology and concepts of the OSI reference model and the TCP -IP reference model.

MCA-DS-210.5. Analyze why networks need security and control, what errors might occur, and how to control network errors.

MCA-DS-210.6. Define the concept of local area networks, their topologies, protocols and applications and IEEE standards.

MCA-DS-210.7. Understand and explain and Applying pieces of hardware and software to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.

PART-A

UNIT 1: Basic Concepts of Data Communication

- 1.1 Introduction to data communication
- 1.2 Components of data communication
- 1.3 Advantages and applications of Networking
- 1.4 Network Topologies
- 1.5 Network Protocols
- 1.6 Connection –oriented and Connection-less Services
- 1.7 Modes of data transmission

UNIT 2: Signals and Transmission Media

- 2.1 Signal and data
- 2.2 Channel Characteristics
- 2.3 Encoding and Modulation Techniques
- 2.4 Transmission Media: Guided Media (Twisted Pair, Co-axial cable, Optical Fiber), Unguided Media (Radio, Microwave, Satellite)
- 2.5 Transmission Impairments
- 2.6 Multiplexing (Frequency Division Multiplexing, Time Division Multiplexing, Wavelength Division Multiplexing)
- 2.7 Switching (Circuit Switching, Packet Switching, Message Switching)

UNIT 3: System Architecture and Layered Protocol Models

- 3.5 Protocol hierarchies
- 3.6 Layered Architecture
- 3.3 ISO OSI Reference Model
- 3.4 TCP/IP Model

PART-B

UNIT 4: Data link Layer

- 4.1 Functions of Data Link Layer
- 4.1 Framing of data
- 4.2 Flow Control

- 4.3 Error control
- 4.4 High Level Data Link Control (HDLC)
- 4.5 Error detection Techniques (VRC,LRC, CRC, Checksum)
- 4.6 Error Correction Techniques (Single Bit Error Correction, Hamming Code and Burst Error Correction)
- 4.7 Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

UNIT 5: Transport Layer

- 5.1 Functions of Transport Layer
- 5.2 TCP and UDP
- 5.3 Routing Algorithms (Static Routing Algorithms: Shortest Path Routing, Dynamic Routing: Distance Vector Routing, Link State Routing)
- 5.4 Congestion control (Congestion Avoidance, Discarding and Leaky Bucket Algorithm)
- 5.5 Fault handling
- 5.6 Access control

UNIT 6: IEEE Standards, Protocols & Addressing

- 6.1 Logical link Control (LLC)
- 6.2 IEEE Standard 802.3(Ethernet)
- 6.3 IEEE Standard 802.4 (Token Bus)
- 6.4 IEEE Standard 802.5 (Token Ring)
- 6.5 X.25
- 6.6 Frame Relay
- 6.7 Asynchronous Transfer Mode (ATM)
- 6.8 IPv4 & IPv6

Suggested Readings:

1. B. Forouzan, 2001, Data Communication and Networking, Tata McGraw Hill.
2. A.S. Tanenbaum, 1994, Computer networks, Prentice Hall.
3. Tomasi Wayne, 2004, Introduction to Data Communication & Networking, Pearson Education
4. Uyles Black, 1994, Computer networks: Protocol Standards and Interfaces, Prentice Hall Education

Note: Only latest editions of the books are recommended.

Weblinks:

- <https://www.smartzworld.com/notes/computer-network-cn-notes-pdf>
- <https://www.tutorialspoint.com>
- www.tutorialspoint.com/listtutorials/networking/1

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2
MCA-DS-210.1		2	3		2	1	1					1		3
MCA-DS-210.2		2	2				1						2	3
MCA-DS-210.3		2	2	2			1						3	2
MCA-DS-210.4	2						2						2	2
MCA-DS-210.5		1	2		2		1						2	3
MCA-DS-210.6	2		3	1	3				1	3	3	1	3	3
MCA-DS-210.7	2		2		2	1	3		2	1	3	3	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-211: ANALYSIS & DESIGN OF ALGORITHM

Periods/week Credits

L: 3 T: 0 3

Duration of Examination: 3 Hrs

Marks : 200

Continuous Evaluation : 100

End Semester Examination : 100

Pre-Requisite: Knowledge of C Programming and Data

Course Type: Core

Course Outcomes: At the end of the course, students will be able to:

MCA-DS-211.1. Learn the basics of various computer algorithms.

MCA-DS-211.2. Understand the algorithm in terms of time and space complexity.

MCA-DS-211.3. Apply Divide & Conquer approach and Greedy method to solve critical problems.

MCA-DS-211.4. Analyze algorithms for finding optimal solution

MCA-DS-211.5. Evaluate programming problems using Backtracking method.

MCA-DS-211.6. Design the deterministic and non-deterministic polynomial time algorithms.

PART-A

UNIT 1: Introduction to Algorithm

- 1.1 Algorithm analysis
- 1.2 Problem solving approach
- 1.3 Asymptotic analysis
- 1.4 Analysis of Non-recursive and Recursive Algorithm
- 1.5 Sets and disjoint sets union

UNIT 2: Divide and Conquer approach

- 2.1 Introduction to Divide and Conquer approach
- 2.2 Binary search
- 2.3 Merge sort
- 2.4 Quick sort
- 2.5 Selection sort
- 2.6 Strassen's matrix multiplication algorithms

UNIT 3: Greedy Method

- 3.1 Introduction to Greedy Method
- 3.2 Knapsack problem
- 3.3 Job sequencing with dead lines
- 3.4 Minimum Spanning Trees: Kruskal and Prim's method
- 3.5 Single source shortest paths (Dijkstra's algorithm).

PART-B

UNIT 4: Dynamic Programming

- 4.1 General method
- 4.2 Optimal binary search trees
- 4.3 0/1 knapsack
- 4.4 Traveling salesperson problem

UNIT 5: Backtracking

- 5.1 General Method
- 5.2 queen's problem
- 5.3 Graph colouring
- 5.4 Hamiltonian cycles
- 5.5 Introduction to Branch and Bound approach
- 5.6 0/1 knapsack
- 5.7 Traveling salesperson problem.

UNIT 6: Problem Classes

- 6.1 Polynomial and Non Polynomial classes
- 6.2 NP-hard and NP-complete
- 6.3 Deterministic and non-deterministic polynomial time algorithms,
- 6.4 Cook's theorem
- 6.5 NP scheduling problems.

Suggested Readings:

- Ellis Horowitz and Sartaj Sahni, 2008, Fundamentals of Computer Algorithms, Computer Science Press.
- Aho A.V.Hopcroft J.E, 1974, The Design and Analysis of Computer Algorithm, Addison Wesley.
- Thomas H. Coreman, 2009, Introduction to Algorithm, McGraw-Hill

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Dev C/ Turbo C++

https://www.tutorialspoint.com/design_and_analysis_of_algorithms/

<https://www.youtube.com/watch?v=1PI58Q3Ne2w>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
MCA-DS-211.1	3	3	3	3	1		3				2	3	3	3
MCA-DS-211.2	3	3	3	2	2		2				2	3	3	3
MCA-DS-211.3	3	3	3	3	3		3				2	3	3	3
MCA-DS-211.4	3	3	3	2	1		2				2	3	3	3
MCA-DS-211.5	3	3	3	3	3		3	2			2	3	3	3
MCA-DS-211.6	1	2	1	2	1		2				2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-212: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Periods/week Credits
L: 3 T: 0 3
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: Basics of Data Structure

Course Type: Core

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

MCA-DS-212.1. Understand the fundamental concepts of Artificial Intelligence.

MCA-DS-212.2. Interpret the problem as a state space, graph, design heuristics and select amongst different search or game-based techniques to solve them.

MCA-DS-212.3. Apply knowledge representation, reasoning, and machine learning techniques to real-world problems

MCA-DS-212.4. Examine various AI search algorithms

MCA-DS-212.5. Assess critically the Artificial Intelligence techniques presented and apply them to real world problems

PART-A

Unit 1: Introduction to Artificial Intelligence

- 1.1 Foundations, scope, problems, characteristics, examples and approaches of AI
- 1.2 Application Areas of Artificial Intelligence
- 1.3 Problem solving in Artificial Intelligence: Tic-Tac-Toe, Water Jug problem
- 1.4 Current trends in Intelligent Systems
- 1.5 AI application to robotics
- 1.6 Goal driven Learning agents
- 1.7 Programming Languages of Artificial Intelligence

Unit 2: Problem Solving Concepts and AI Search Techniques

- 2.1 Problem Solving Concepts and Methods
- 2.2 Types of Search techniques: Uninformed (Blind) and Informed (Informed) techniques
- 2.3 Blind search techniques: Breadth-First search and Depth- First search methods
- 2.4 Heuristic search techniques
- 2.5 Best First search, Means-ends Analysis Technique
- 2.6 Problem reduction, Constraint satisfaction

Unit 3: Knowledge Representation

- 3.1 Foundations of knowledge representation and reasoning
- 3.2 Propositional and Predicate logic
- 3.3 Syntax and Semantics for first order logic
- 3.4 Resolution and Unification
- 3.5 Knowledge representation schemes: semantic nets, frames.

PART-B

Unit 4: Reasoning and Game Playing

- 4.1 Reasoning about Knowledge, Default Reasoning
- 4.2 Reasoning with uncertain knowledge
- 4.3 Probability Based Reasoning
- 4.4 Reasoning Using Certainty Factors; Bayes Theorem
- 4.5 Fuzzy Based Reasoning Systems

4.6 Games playing: Minimax algorithm, Tic-Tac-Toe

Unit 5: Expert Systems & Natural Language Processing

- 5.1 Expert system: Definition and applications
- 5.2 Characteristics of expert system
- 5.3 Basic components & architecture of expert systems
- 5.4 Introduction to Natural Language Processing (NLP)
- 5.5 Parsing techniques

Unit 6: Machine Learning and Neural Networks

- 6.1 Introduction to Machine Learning
- 6.2 Learning techniques
- 6.3 Applications of Machine Learning
- 6.4 Introduction to Neural Network
- 6.5 Artificial and Biological Neurons
- 6.6 Classifications of Neural Network

Suggested Readings:

1. Stuart Russell and Peter Norvig, 1995, Artificial Intelligence: A Modern Approach, Pearson Education Press
2. Kevin Knight, Elaine Rich, B. Nair, 2017, Artificial Intelligence, McGraw Hill.
3. George F. Luger, 2002, Artificial Intelligence, Pearson Education.

Note: Only latest editions of the books are recommended.

Web links:

- http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf
- https://epub.uni-regensburg.de/13629/1/ubr06078_ocr.pdf
- <http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html>
- <https://www.docsity.com/en/study-notes/computer-science/artificial-intelligence/>
- <https://examupdates.in/artificial-intelligence-pdf/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-213: VOCATIONAL TRAINING

Periods/week Credits
4 Weeks 2
Duration of Examination: 2 Hrs

Max. Marks: 100
Continuous Evaluation: 100
End Semester Examination: ---

Course Outcomes: At the end of the course, students will be able to

MCA-DS-213.1 Describe the Systems Development Life Cycle (SDLC).

MCA-DS-213.2 Construct and evaluate data flow diagrams.

MCA-DS-213.3 Design and evaluate system outputs

MCA-DS-213.4 Construct and evaluate entity-relationship (ER) diagrams for real projects

MCA-DS-213.5 Determine the various test cases and analyze the results.

MCA-DS-213.6 Develop soft-skills including writing formal reports and delivering oral presentations.

Internship experience provides the student with an opportunity to enhance the knowledge in their respective subject areas. This training provides insight to understand the actual behaviour of the industry able to develop a greater understanding about the career option. Each of the students is required to develop a mini project during his/ her one month internship. Evaluation will be done by the respective mentors. Internal assessment will be done on the basis of following criteria:

1. Presentation - 30 marks
2. Viva - 50 marks
3. Thesis/Project report - 20 marks.

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-263: R PROGRAMMING LAB

Periods/week Credits

L: 0 P: 2 1

Duration of Examination: 2 Hrs

Max. Marks : 100

Continuous Evaluation: 50

End Semester Examination : 50

Co-Requisite: Programming in C language

Course Type: Core

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-263.1. Understand to setup R environment and R Console.

MCA-DS-263.2. Demonstrate different data structures (vectors, lists, matrices, data frames) in R.

MCA-DS-263.3. Analyze the various data sets in R programming (importing and exporting of data).

MCA-DS-263.4. Assess the data manipulation technique using R programming

MCA-DS-263.5. Develop an application in R using built-in database..

List of Experiments:-

Activity 1: Concept: Overview of R Console, R script, R Environment and Graphical Output.

- 1) Installation and Environmental setup in R studio.
- 2) Introduction to data types and scripts of R.

Activity 2: Introduction to Arrays & Vectors

- 3) Implement recursive functions using R tool.
- 4) Create and modify matrix using c function (c()) in R tool.
- 5) Create a list using List() and perform List Slicing operation in R tool.
- 6) Create three vectors X, Y, Z with integers and each vector has 3 elements. Combine the three vectors to become a 3x3 matrix A where each column represents a vector. Change the row names to a, b, c.
- 7) Create a vector with 12 integers. Convert the vector to a 4x3 matrix B using matrix(). Please change the column names to X, Y, Z and row names to a, b, c, d.
- 8) Create the vector of for (1, 2, 3, ..., 19, 20, 19, 18, ..., 2, 1)
- 9) Create a vector of values of $e^{\cos(x)}$ at $x = 3, 3.1, 3.2, \dots, 6$;
- 10) Create a character vector with length of number-of-rows-of-iris-dataset, such that, each element gets a character value – "greater than 5" if the corresponding 'Sepal.Length' > 5, else it should get "lesser than 5". Implement it using For Loop.

Activity 3: List and Data Frames in R

- 11) Create a data frame in R and perform various operations.
- 12) Implement Linear Model Formula using 100 variables in R.
- 13) Write a program to expand data frame in R.
- 14) With the dataframes created from code below, perform the various merge operations.

```
set.seed(100)
```

```
Df1 <- iris[sample(1:nrow(iris), 10), c(1,2,3,5)]
```

```
Df2 <- iris[sample(1:nrow(iris), 10), c(1,2,4,5)]
```

```
# induce NAs
```

```
Df1 <- Df1[sample(1:nrow(Df1), 3), 4]
```

```
Df2 <- Df2[sample(1:nrow(Df1), 3), 4]
```

Activity 4: Data Analysis in R (Importing and exporting of data)

- 15) Generate Exploratory Analysis of Big Mart Data Set.
- 16) Generate Exploratory Analysis of Train Data Set.
- 17) Show graphical representation of Big Mart Data set using Univariate Analysis and Bivariate Analysis.
- 18) Show graphical representation of Train Data Set using Univariate Analysis and Bivariate Analysis.

Activity 5: Data Manipulation in R.

- 19) Calculate the count of Outlet Identifiers, Item Identifiers and Outlet years of Big mart Data Set.
- 20) Calculate the count of Outlet Identifiers, Item Identifiers and Outlet years of Big mart Data Set.

Note: Faculty can suggest more practical assignment and projects as per the need.

Suggested Readings:

1. Garrett Golemund, 2014, Hands on Programming with R
2. Mark Gardener, 2013, Beginning R: The Statistical Programming Language

Note: Only latest editions of the books are recommended.

Software required:

R Studio

Distribution of Continuous Evaluation Table:

Viva-I	30%
Viva-II	30%
File/ Records	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Experiments in lab
 File work/Class Performance
 Viva (Question and answers in lab)
 End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
MCA-DS-263.1	1	1	1	1	2								3	3
MCA-DS-263.2	2	2	1	1	2								3	3
MCA-DS-263.3	3	3	2	2	2								3	3
MCA-DS-263.4	3	2	2	3	2								3	3
MCA-DS-263.5	1	2	3	3	2						2		3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-264: ANDROID APPLICATION DEVELOPMENT LAB

Periods/week	Credits	Max. Marks: 100
P: 2 T: 0	1	Continuous Evaluation: 50
Duration of Examination: 2 Hrs		End Semester Examination: 50

Co-Requisite: Knowledge of Java.

Course Type: Core

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-264.1 Describe the application lifecycle, intents, and activities.

MCA-DS-264.2 Create mobile applications on the Android Platform.

MCA-DS-264.3 Create mobile applications involving data storage in SQLite Database.

MCA-DS-264.4 Deploy and maintain the Android Application.

Concepts & List of Experiments:

Activity 1:

Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.

Activity 2:

Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use

1. Linear Layout
2. Relative Layout and
3. Grid Layout or Table Layout.

Activity 3:

Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a Back button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.

Activity 4:

Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.

Activity 5:

Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.

Activity 6:

Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line) When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.

Activity 7:

1. Create a user registration application that stores the user details in a database table.

2. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

Activity 8:

Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.

Activity 9:

Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.

Activity 10:

Develop an application that shows the current locations latitude and longitude continuously as the device is moving (tracking)

Recommended Small Projects:

- a) Create an accident alert app.
- b) Create a diet planner app
- c) Create an application for budget management of your family.
- d) Create an application to stimulate calculator
- e) Create an application to simulate Notepad
- f) Create an application for Women Protection System

Note: Faculty can suggest more practical assignment and projects as per the need.

Suggested Readings:

1. Reto Meier, 2010, Professional Android
2. Application Development 2. Marko Gargenta, 2014, Learning Android
3. Lauren Darcey, 2010, Sams Teach Yourself Android Application Development in 24 Hours

Software required/ Web links:

Android Studio 3.x

Android SDK

<https://developer.android.com/guide/>

<https://www.javatpoint.com/android-tutorial>

<https://hackr.io/tutorials/learn-android-development>

Distribution of Continuous Evaluation Table:

Viva-I	30%
Viva-II	30%
File/ Records	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Experiments in lab

File work/Class

Performance Viva (Question and answers in lab)

End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-264.1	2	3	2		3								2	3
MCA-DS-264.2	2	3			3									
MCA-DS-264.3	1	3	2		3									
MCA-DS-264.4	2	3	2	2	3		1	1	1		1	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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CDC 512: Placement Competency Enhancement-II

Periods/week Credits
L: 0 T: 4 2
Duration of Examination: 3 Hrs

Max. Marks: 100
Continuous Evaluation: 50
End Semester Examination: 50

Pre-requisite: None

Course Type: Elective

Course Outcomes: At the end of the course the student will be able to:

CDC-512.1: Enhance their ability to write, read, comprehend and communicate effectively to increase the productivity of business.

CDC-512.2: Get proficient in resume building and drafting effective cover letters.

CDC-512.3: Enhance professionalism and display positive attitude throughout

CDC-512.4: Enhance their placement prospects and manage interviews effectively.

CDC-512.5: Recognize problem based on Modern Mathematics and Algebra

CDC-512.6: Calculate solution to logical reasoning.

Part - A (VERBAL ABILITY)

Unit 1: Word Order and Sentence Construction

- 1.1 One Word Substitution
- 1.2 Ordering of Words
- 1.3 Sentence Improvement, ordering of sentences
- 1.4 Spotting Errors
- 1.5 Change of Voice/ Direct & Indirect speech

Unit 2: Reading Comprehension & Reasoning

- 2.1 Strategic Reading, Eliminating Poor Reading Habits
- 2.2 Techniques to increase speed reading, comprehension and recall
- 2.3 Solving Sample RC Passages
- 2.4 Cloze Test
- 2.5 Para Jumbles

PART – B (INTERVIEW ENHANCEMENT)

Unit 3: Professional Behavior

- 3.1. Showcasing Professional Attitude in an interview
- 3.2. Rejection Analysis in an interview
- 3.3. What not to do in an interview

Unit 4: Interviews Prep- II

- 4.1. Interview readiness tip to toe.
- 4.2. Body Language in interviews
- 4.3. Resume Check
- 4.4. Answering Difficult Questions in an Interview
- 4.5 Mock Interviews
- 4.6 Researching the Employer

PART – C (APTITUDE)

Unit 5: Arithmetic -II

5.1 Average
5.2 Time & Work
5.3 Mixture & Allegation 5.4 Data Interpretation

Unit 6 : Advanced Aptitude

6.1 Permutation & Combination 6.2 Probability
6.3 Syllogism
6.4 Data Sufficiency

MRPDRS

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-214: COMPUTER GRAPHICS

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-requisite: None

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-DS-214.1: Describe the basic concepts of computer graphics and its applications in day to day life.

MCA-DS-214.2: Summarize and interpret the various categories of graphics algorithms.

MCA-DS-214.3: Apply various scan conversion algorithms on real life problems.

MCA-DS-214.4: Apply effective editing by using different transformations on 2D and 3D objects.

MCA-DS-214.5: Categorize the different object shapes and their detection methods in 2D and 3D viewing.

MCA-DS-214.6: Demonstrate practical applications on computer graphics to continue professional development.

PART-A

UNIT 1: Introduction to Computer Graphics

- 1.1 Basic concepts of Computer Graphics
- 1.2 Computer graphics hardware, Software and Standards
- 1.3 User Interface: Console User Interface (CUI) and Graphical User Interface (GUI)
- 1.4 Application of Computer Graphics
- 1.5 Input – Output Devices
- 1.6 Cathode Ray Tube
- 1.7 Color Monitors
- 1.8 Flat Panel Devices
- 1.9 Direct View Storage Tube
- 1.10 Frame Buffer
- 1.11 Display Processor

UNIT 2: Scan Conversion

- 2.1 Scan Conversion of Point, Line, and Circle
- 2.2 Line Drawing Algorithm: Slope Intercept, DDA and Bresenham's
- 2.3 Circle Drawing Algorithm s: Mid Point, Bresenham's
- 2.4 Ellipse Drawing Algorithm
- 2.5 Antialiasing

UNIT 3: Curve drawing and Polygon filling Algorithms

- 3.1 Introduction to Curve Hierarchy
- 3.1 Bezier Curve
- 3.2 B-spline Curve
- 3.3 Area Fill Attributes: Fill style, Pattern Fill, Soft fills
- 3.4 Solid Modelling Techniques: Sweep Representation, Constructive Solid Geometry, Octtree, BSP Tree
- 3.4 Filling of Curved Boundary: Boundary fill algorithm, Flood fill algorithm.
- 3.5 Character Generation

PART-B

UNIT 4: Transformation & Projection

- 4.1 Two Dimensional and Three-Dimensional graphics concepts
- 4.2 Introduction to basic Matrix Operation
- 4.3 2-D transformation: Translation; Scaling; Rotation; Reflection, Shearing.
- 4.4 Composite transformations
- 4.5 3-D Transformation: Translation; Scaling; Rotation.
- 4.6 Numerical Implementation of 2D and 3D Transformation

- 4.7 Introduction to Projection
- 4.8 Types of projections : Parallel & Perspective

UNIT 5: Clipping

- 5.1 Introduction to Window and Viewport
- 5.2 Viewing pipeline
- 5.3 Viewing Coordinate Reference Frame
- 5.4 Window to Viewport mapping
- 5.5 Introduction to Clipping
- 5.6 Point Clipping Algorithm
- 5.7 Line Clipping Algorithms: Cohen Sutherland, Liang Barsky
- 5.8 Polygon Clipping Algorithm: Sutherland-Hodgeman, Weiler Antherton

UNIT 6: Visible Surface Detection Methods

- 6.1 Concept of Hidden Line & Surfaces
- 6.2 Classification of Visible Surface Detection Algorithm
- 6.3 Back Face Detection
- 6.4 Depth Buffer Method
- 6.5 Depth Sorting Method
- 6.6 Wireframe Methods
- 6.7 Visibility Detection Functions

Suggested Readings:

1. D Hearn & P M Baker, 2002, Computer Graphics, Prentice Hall
2. J D Foley & A Van Dam, 1983, Fundamentals of interactive Computer Graphics, Addison Wesley
3. Schaum Series, 2004, Computer Graphics, Tata McGraw Hill
4. Pradeep K. Bhatia, 2013, Computer Graphics, I.K. International

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-214.1		2				1	2	1	1	1	1		2	2
MCA-DS-214.2	2		1			1	2	1	1	1	2		1	1
MCA-DS-214.3	2		1			1	2	1	1	1	2		1	3
MCA-DS-214.4	2		1			1	2	1	1	1	2		1	3
MCA-DS-214.5	2	2		2	2	1	2	2	2	1	2		2	2
MCA-DS-214.6	2					1	1	1	1	1	1	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-215: WEB APPLICATIONS DEVELOPMENT USING PHP

Periods/week	Credits	Max. Marks: 200
L: 2	2	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of Programming Languages and Database Management System

Course Type: Domain Specific

Course Outcomes: At the end of the course, students will be able to

MCA-DS-215.1. Learn basics of Web Programming.

MCA-DS-215.2. Understand the concepts of different frameworks for website designing.

MCA-DS-215.3. Apply different tools and run commands for developing interactive website.

MCA-DS-215.4. Analyze the interface and make connectivity with database.

MCA-DS-215.5. Create and design website using PHP and MySQL.

PART –A

UNIT 1: HTML Basics

- 1.1 Principles involved in developing website
- 1.2 Five golden rules of web designing
- 1.3 Web Standards
- 1.4 Introduction to HTML
- 1.5 Basic Structure of HTML document
- 1.6 HTML Tags
- 1.7 Content layout and presentation
- 1.8 Working with images
- 1.9 Working with Lists
- 1.10 Table Handling
- 1.11 Frame Design
- 1.12 Form Design

UNIT 2: Introduction to Cascading Style Sheets and JavaScript

- 2.1 Introduction to Cascading Style Sheet
- 2.2 CSS Properties
- 2.3 Internal Style sheets
- 2.4 External Style sheets
- 2.5 Inline Style sheets
- 2.6 CSS ID and Class
- 2.7 Introduction to JavaScript: Document Object Model
- 2.8 JavaScript identifiers
- 2.9 JavaScript Operators
- 2.10 Control & Looping structure
- 2.11 Creating Dialog Boxes

Unit 3: Hypertext Preprocessor (PHP) Concepts

- 3.1 Introduction to PHP
- 3.2 PHP history and importance
- 3.3 Variables and Constants in PHP
- 3.4 Data types in PHP
- 3.5 Operators in PHP
- 3.6 Conditional statements
- 3.7 Loops
- 3.8 Date and Time and Image uploading in PHP
- 3.9 Creating and accessing string

- 3.10 String functions
- 3.11 Working with PHP forms: Get and Post methods
- 3.12 Form Validation
- 3.13 Session Handling

PART-B

UNIT 4: Working with Arrays and Files

- 4.1 Concept of Arrays
- 4.2 Types of Arrays: Index based arrays and Associative Arrays
- 4.3 Accessing Arrays
- 4.4 Single dimensional Arrays
- 4.5 Multidimensional array
- 4.6 Opening and Closing of File
- 4.7 Introduction to Objects
- 4.8 Copying, renaming and deleting of file
- 4.9 Working with directories
- 4.10 Building text editor
- 4.11 File uploading and downloading

UNIT 5: Object Oriented Programming in PHP

- 5.1 Declaring a class
- 5.2 The new keyword and constructor
- 5.3 Destructor
- 5.4 Access method and properties using \$this variable
- 5.5 Public, private, protected properties and methods
- 5.6 Inheritance
- 5.7 Polymorphism
- 5.8 Exception Handling: Understanding Exception and error
- 5.9 Try, catch, and throw

UNIT 6: Connection with MySQL Database and Introduction to Frameworks

- 6.1 Introduction to MySQL
- 6.2 Performing basic database operation (DML): Insert, Delete, Update, Select from PHP Scripts
- 6.3 Executing parameterized query
- 6.4 Joins: Cross joins, Inner joins, Outer Joins, Self joins
- 6.5 Storing and retrieving data from MySQL DB using PHP based forms
- 6.6 Sending Email using PHP form
- 6.7 Introduction to Frameworks (Word Press)

Suggested Readings:

1. Ivan Bayross, 2010, HTML, DHTML, PERL, CGI, BPB Publications.
2. Mike McGrath, 2012, PHP and MySQL, Tata McGraw Hill
3. Lynn Beighley, 2008, Head First PHP & MySQL, O'Reilly Media
4. W.Jason Gilmore, 2010, Beginning PHP and MySQL from Novice to Professional, Apress.
5. Luke Welling Laura Thomson, 2016, PHP and MySQL web Development, Addison-Wesley Professional

Note: Only latest editions of the books are recommended

Software required/ Web links:

Web Server: Apache HTTP Server 2.2

Database Server: MySQL Server 5.0

<https://www.phptpoint.com/software-requirement/>

<https://www.javatpoint.com/php-tutorial>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-215.1	3	2	1			2							2	2
MCA-DS-215.2		1		1			1	1	1	2			1	1
MCA-DS-215.3		3							1				1	3
MCA-DS-215.4		3						1					1	3
MCA-DS-215.5		3	3	2	2	1	1	1		1			2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-CC-003: CLOUD COMPUTING PLATFORMS

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max Marks : 200
Continuous Evaluation: 100
End Semester Examination : 100

Pre-Requisite: Knowledge of Cloud
Course Type: Core

Course Outcomes: At the end of the course, students will be able to
MCA-CC-003.1 Understand the core concepts of cloud computing
MCA-CC-003.2 Evaluate and differentiate between major cloud computing platforms.
MCA-CC-003.3. Deploy, manage, and optimize resources on various cloud platforms.
MCA-CC-003.4. Develop cloud-native applications tailored to specific cloud services.
MCA-CC-003.5. Analyze real-world use cases and business scenarios for selecting cloud platforms.

PART -A

Unit 1: Introduction to Cloud Computing Platforms

- 1.1 Defining Cloud Platforms
- 1.2 Features and Benefits of Cloud Platforms
- 1.3 Types of Cloud Computing Platforms
- 1.4 Brief Introduction of popular Cloud Computing Platforms

Unit 2: Amazon Web Services (AWS)

- 2.1 Overview of AWS Services and Core Infrastructure.
- 2.2 EC2: Virtual Servers in the Cloud.
- 2.3 S3: Scalable Storage in the Cloud.
- 2.4 RDS: Managed Relational Databases.
- 2.5 Lambda: Serverless Computing.
- 2.6 Deployment and Best Practices on AWS.

Unit 3: Microsoft Azure

- 3.1 Azure Core Services and Resource Management.
- 3.2 Azure Virtual Machines.
- 3.3 Azure Storage (Blob, Table, Queue)
- 3.4 Azure Networking (Virtual Network, ExpressRoute)
- 3.5 Azure SQL Database.
- 3.6 Azure Functions.
- 3.7 Azure Deployment and Governance.

PART -B

Unit 4: Google Cloud Platform (GCP)

- 4.1 Introduction to GCP Services and Resources.
- 4.2 Compute Engine and Kubernetes Engine
- 4.3 GCP storage (Cloud Storage, Bigtable)
- 4.4 Networking in GCP (VPC, Load Balancing)
- 4.5 GCP databases (Cloud SQL, Firestore)
- 4.6 Google Cloud security and compliance
- 4.7 Managing Resources on GCP.

Unit 5: Other Cloud Platforms

- 5.1 IBM Cloud: Services and Deployment.
- 5.2 Oracle Cloud: Offerings and Use Cases.

- 5.3 Alibaba Cloud: Core Services and Solutions.
- 5.4 Hybrid and Multi-Cloud Strategies.
- 5.5 Comparative Analysis of Different Cloud Platforms.

Unit 6: Cloud-Native Application Development

- 6.1 Building Cloud-Native Applications.
- 6.2 Containerization and Orchestration (Docker and Kubernetes).
- 6.3 DevOps and Continuous Integration/Continuous Deployment (CI/CD).
- 6.4 Serverless Computing and Microservices.
- 6.5 Case Studies and Real-World Cloud Platform Selection Scenarios.

Suggested Readings:

- 1. Thomas Erl, 2023, Cloud Computing: Concepts, Technology & Architecture, PHI
- 2. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, 2013, "Mastering cloud computing", Tata McGraw Hill Education Private Limited.
- 3. Anthony T.Velte, Toby J. Velte, Robert Elsenpeter, 2010, "Cloud Computing a Practical Approach", Tata McGraw-HILL.
- 4. James Loope, 2011, "Managing Infrastructure with puppet", O'REILLY.

Note: Only latest editions of the books are recommended.

Web Links:

- 1. <https://cloud.google.com/appengine/docs>
- 2. <https://www.chef.io/solutions/cloud-management>
- 3. <https://aws.amazon.com/documentation>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination
- Final project (develop a cloud-based application)

Course Articulation Matrix:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
MCA-CC-003.1	1	2	3	3	1		3				2	2	2	1
MCA-CC-003.2	2	2	3	2	3		2	2			3	3	3	1
MCA-CC-003.3	2	3	3	3	3		3	2	2		2	3	3	2
MCA-CC-003.4	3	3	3	2	1		2		2		1	3	1	3
MCA-CC-003.5	2	3	3	3	3		3	2			1	3	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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MCA-CC-004: PROGRAMMING WITH AWS

Periods/week Credits
L :2 T: 0 2.0

Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite:

Course Type: Domain Elective

Course Outcomes: Students will be able to –

MCA-CC-004.1 Design the overall networking environment for servers.

MCA-CC-004.2 Deploy, Manage and Scale applications using container orchestration service.

MCA-CC-004.3 Monitor Server Resources and Account activities.

MCA-CC-004.4 Setup Database Engines and Secure Servers and Services.

PART –A

UNIT 1: Fundamentals of AWS Cloud Computing

- 1.1 Introduction to AWS
- 1.2 AWS Global Infrastructure
- 1.3 AWS Services
- 1.4 AWS Ecosystem
- 1.5 AWS Marketplace

UNIT 2: Elastic Compute Cloud

- 2.1 Launching our first EC2 instance
- 2.2 EC2 instance types & Pricing Models
- 2.3 Creating AMI and Image Templates
- 2.4 Understanding Security Groups - a Server-side Firewall

UNIT 3: Virtual Private Cloud

- 3.1 Introduction to Network Switches & Virtual Private Cloud
- 3.2 VPC & Subnets
- 3.3 Private and Public Subnets
- 3.4 Internet Gateways, VPC Peering & NAT Gateways
- 3.5 VPN Setup

PART–B

UNIT 4: Storage

- 4.1 Introduction to Block & Object storage mechanism
- 4.2 Introduction to Elastic Block Store – EBS
- 4.3 EBS Snapshots
- 4.4 Introduction to Simple Storage Service (S3)
- 4.5 Features of S3

UNIT 5: Elastic Load Balancers and Elasticity

- 5.1 Understanding High Availability Configuration
- 5.2 ELB Configuration with Classic and Application Load Balancers
- 5.3 Auto Scaling

UNIT 6: AWS ECS

- 6.1 Getting Started with Containerization
- 6.2 ECS Services and Tasks
- 6.3 Load Balancing in ECS
- 6.4 ECS Scaling

Suggested Books:

1. John Culkin, 2021, AWS Cookbook, O'Reilly media
2. Dylan Shields, 2022, AWS Security, Manning

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.simplilearn.com/tutorials/aws-tutorial/aws-load-balancer>

<https://www.javatpoint.com/aws-tutorial>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

Course Articulation Matrix:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
MCA-CC-004.1	1	1	1	1	1		3				2		2	1
MCA-CC-004.2	3	2	2	2	3		2	3				3		1
MCA-CC-004.3	2	1	2	3	3		3	3	2				3	
MCA-CC-004.4	3	1	3	1	1		1		2					2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)
NAAC 'A' Grade University

MCA-AI-003: SUPERVISED LEARNING

Periods/week Credits
L :2 T: 0 2.0

Duration of Exam: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic Knowledge of Data Mining

Course Outcomes: Students will be able to –

MCA-AI-003.1 Understand how to select an appropriate supervised machine learning method for a given scenario and dataset.

MCA-AI-003.2 Understand the tradeoffs inherent in different machine learning methods: speed, accuracy, complexity of hypothesis space, etc.

MCA-AI-003.3. Increase awareness of issues of algorithmic bias, transparency, fairness in supervised machine learning applications.

PART –A

UNIT 1: Introduction to Supervised Learning

- 1.1 Introduction to Supervised learning
- 1.2 Supervised learning algorithms
- 1.3 Training and tuning in supervised learning
- 1.4 Model evaluation in supervised learning
- 1.5 Applications of Supervised learning

UNIT 2: Linear Regression

- 2.1 Regression basics: Relationship between attributes using Covariance and Correlation
- 2.2 Relationship between multiple variables: Regression (Linear, Multivariate) in prediction.
- 2.3 Residual Analysis
- 2.4 Identifying significant features, feature reduction using AIC, multi-collinearity
- 2.5 Hypothesis testing of Regression Model

UNIT 3: Multiple Linear Regression

- 3.1 Polynomial Regression
- 3.2 Regularization methods
- 3.3 Lasso, Ridge and Elastic nets
- 3.4 Categorical Variables in Regression

PART – B

UNIT 4: Non-Linear Regression

- 4.1 Logit function and interpretation
- 4.2 Types of error measures (ROCR)
- 4.3 Logistic Regression in classification

UNIT 5: Classification

- 5.1 Basic Concepts
- 5.2 Decision Tree Induction
- 5.3 Bayes Classification Methods
- 5.4 Introducing Ensemble methods
- 5.5 Support Vector Machine

UNIT 6: Clustering

- 6.1 Distance measures
- 6.2 Different clustering methods (Distance, Density, Hierarchical)
- 6.3 Iterative distance-based clustering;
- 6.4 Dealing with continuous, categorical values in K-Means
- 6.6 Constructing a hierarchical cluster

Suggested Readings:

1. Peter Bruce, 2020, Practical Statistics for Data Scientists, 2e: 50+ Essential Concepts Using R and Python, O'Reilly
2. Andrew Park, 2020, Data Science for Beginners

Note: Only latest editions of the books are recommended.

Web Links:

- <https://www.w3schools.com/datascience/>
- <https://www.javatpoint.com/data-science>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AI-003.1	2	2		3	2		2					1	2	3
MCA-AI-003.2	2	2	3	1	2		1						3	2
MCA-AI-003.3	2		1	2	2							2		1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-AI-004: TEXT MINING

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Data structure, algorithms & programming language (Java/Python)

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-AI-004.1. Understand basic concepts and theories of text mining and utilize computational tools and methods for text mining

MCA-AI-004.2. Learn the fundamentals of natural language processing & tools

MCA-AI-004.3. Classify text and design associated algorithms

MCA-AI-004.4. Understand the concept text clustering & text modelling

MCA-AI-004.5. Know the concepts of social media & network analysis

MCA-AI-004.6. Analyze sentiments problems and emotions detection approaches

PART-A

Unit 1: Natural language processing

- 1.1 Foundations of natural language processing
- 1.2 Language syntax and structure
- 1.3 Text pre-processing and Wrangling,
- 1.4 Stemming, Lemmetization
- 1.5 Removing stop words.
- 1.6 Future engineering for text representation

Unit 2: Text classification

- 2.1 The Vector Space Model and tf-idf weighting, representing unstructured text documents with appropriate format
- 2.2 Feature selection and text categorization algorithms
- 2.3 Naive Bayes, k-Nearest Neighbor (kNN),
- 2.4 Logistic Regression,
- 2.5 Support Vector Machines and Decision Trees.
- 2.6 Evaluation of text classification: precision and recall, confusion matrix, F-score

Unit 3: Text clustering & Topic Modelling

- 2.1 Clustering algorithms,
- 2.2 Connectivity-based clustering (hierarchical clustering)
- 2.3 Centroid-based clustering (k-means clustering)
- 2.4 Evaluation of text clustering: purity and Rand index
- 2.5 Concept of topic modelling
- 2.6 Topic models—Probabilistic Latent Semantic Indexing (pLSI) and Latent Dirichlet Allocation (LDA)
- 2.7 Document summarization

PART-B

Unit 4: Social-Media and Network analysis

- 4.1 Characteristic of social network, inter-connectivity
- 4.2 Google's winning algorithm PageRank
- 4.3 social influence analysis and social media analysis

Unit 5: Sentiment analysis

- 5.1 Definition of the sentiment analysis problem
- 5.2 Differences between sentiment analysis and emotion detection
- 5.3 sentiment polarity prediction, mining and aspect identification

- 5.4 Lexicon-based approaches to sentiment analysis
- 5.5 Key approaches to exploit dictionaries, ontologies,
- 5.6 specialized corpora for detecting the sentiment polarity in texts
- 5.7 Machine learning approaches to sentiment analysis
- 5.8 Overview of neural network architectures for sentiment analysis

Unit 6: Affect and emotion detection

- 6.1 Survey and definition of affect and emotion detection in texts
- 6.2 Differences between the tasks of detection of sentiment, feelings, emotions, and opinion
- 6.3 Modeling language of emotions using neural networks and statistical language model
- 6.4 Multimodal approaches to emotion detection
Exploitation of multimodal data (e.g., face and body language in video and audio recordings) to detect language of emotions

Suggested Readings:

1. Charu C. Aggarwal and ChengXiang Zhai, 2012, "Mining Text Data", Springer
2. Dan Jurafsky and James H Martin, 2000, "Speech & Language Processing", Pearson Education India
3. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, 2007, "Introduction to Information Retrieval", Cambridge University Press
4. Liu, B., 2012, Sentiment analysis and opinion mining. Synthesis lectures on human language technologies, 5(1), 1-167.
5. Munezero, M. D., Montero, C. S., Sutinen, E., & Pajunen, J., 2014, Are they different? Affect, feeling, emotion, sentiment, and opinion detection in text. IEEE transactions on affective computing
6. Calvo, R. A., & D’Mello, S., 2010, Affect detection: An interdisciplinary review of models, methods, and their applications. IEEE Transactions on affective computing

Note: Only latest editions of the books are recommended.

Web links:

1. <https://www.educba.com/text-mining/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Sessional-II	30%
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Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AI-004.1		1	3	1	1		1					1	2	2
MCA-AI-004.2	2		2	2	1		1						3	2
MCA-AI-004.3	2	1	1	1	2		3					1	2	2
MCA-AI-004.4		2	2	3	1		2						2	2
MCA-AI-004.5	2		3	2			2	3				3	2	3
MCA-AI-004.6	1	1	1	1	1		2	2				2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-CS-003: CRYPTOGRAPHIC

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic knowledge of Information Security

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-CS-003.1 Understand basic cryptographic algorithms, message and web authentication and security issues.

MCA-CS-003.2 Identify information system requirements for both of them such as client and server.

MCA-CS-003.3 Understand the current legal issues towards information security.

MCA-CS-003.4 Understand the authentication process and algorithm towards information security.

MCA-CS-003.5 Understand the security algorithm towards information security.

PART-A

UNIT 1: Introduction:

- 1.1 Security Attacks
- 1.2 Security Services
- 1.3 Integrity check
- 1.5 Digital Signature
- 1.5 Authentication

Unit 2: Secret Key Cryptography:

- 2.1 Block Encryption
- 2.2 DES rounds
- 2.3 S-Boxes IDEA
- 2.4 Uses of Secret key Cryptography
- 2.5 ECB, CBC, OFB, CFB
- 2.6 Multiple encryptions DES (AES)

Unit 3: Hash Functions and Message Digests

- 3.1 Length of hash, uses
- 3.2 Algorithms (MD2, MD4, MD5, SHS)
- 3.3 MD2: Algorithm (Padding, checksum, passes.)
- 3.4 MD4 and 5: algorithm (padding, stages, digest computation.)
- 3.5 SHS: Overview, padding, stages

PART-B

Unit 4: Public key Cryptography:

- 4.1 Algorithms
- 4.2 Modular arithmetic (addition, multiplication, inverse, and exponentiation)
- 4.3 RSA: generating keys, encryption and decryption
- 4.4 PKCS
- 4.5 Diffie-Hellman
- 4.6 El-Gamal signatures
- 4.7 DSS, ECC

4.8 Zero-knowledge signatures

UNIT 5: Authentication:

5.1 Password Based, Address Based, Cryptographic Authentication

5.3 Passwords in distributed systems, on-line vs offline guessing

5.3 Cryptographic Authentication: passwords as keys, protocols, KDC's Certification Revocation, Interdomain, groups, delegation

5.4 Authentication of People: Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics

UNIT 6: Security Policies and Security Handshake Pitfalls:

6.1 Security policy

6.2 High and low level policy

6.3 Protocol problems, assumptions

6.4 Shared secret protocols, public key protocols

6.5 Mutual authentication, reflection attacks

6.6 Session keys, one-and two-way public key based authentication

Suggested Readings:

1. Atul Kahate, 2017, Cryptography and Network Security, McGraw Hill.

2. Kaufman, C., Perlman, R., and Speciner, M., 2002, Network Security, Private Communication in a public world, Prentice Hall PTR.

3. Stallings, W., 2003, Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR.

4. Stallings, W., 2000, Network security Essentials: Applications and standards, Prentice Hall.

5. Behrouz A Forouzan, 2007, Cryptography and Network Security; McGraw Hill.

Note: Only latest editions of the books are recommended.

Web Links:

1. <https://www.mygreatlearning.com/blog/cryptography-tutorial/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CS-003.1	3	1	2	2	3		3						3	2
MCA-CS-003.2	2	2	2	3	1		2						3	2
MCA-CS-003.3	1	1	2	1	2								2	1
MCA-CS-003.4	2	1	2	1	1		3						1	2
MCA-CS-003.5	1	1	2	1			2	3					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-CS-004: ETHICAL HACKING

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic knowledge of Information Security

Course Type: Domain Elective

Course Outcome: At the end of the course the student will be able to:

MCA-CS-004.1 To gain knowledge about Ethical hacking and penetration testing.

MCA-CS-004.2 To learn about various types of attacks, attackers and security threats and vulnerabilities present in the computer system.

MCA-CS-004.3 To examine how social engineering can be done by attacker to gain access of useful & sensitive information about the confidential data.

MCA-CS-004.4 To learn about cryptography, and basics of web application attacks.

MCA-CS-004.5 To gain knowledge of the tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities.

Part-A

Unit 1: Introduction t Ethical Hacking

- 1.1 Introduction, What is Ethical Hacking
- 1.2 What are the different types of hackers, Five phases of hacking,
- 1.3 Scope of Ethical Hacking, Brush up Linux, Brush up networking
- 1.4 Information Gathering: Passive Information Gathering, Active Information Gathering

Unit 2: Scanning and Vulnerability

- 2.1 Scanning
- 2.2 System Hacking: Introduction to Metasploit Framework,
- 2.3 Exploit MS17-010 Vulnerability,
- 2.4 Reverse TCP Connection

Unit 3: Hacking

- 3.1 Privileged Escalation using post exploit bypassuac and getsystem,
- 3.2 Reverse connection in different network using port forwarding
- 3.3** Android hacking using reverse TCP connection

Part-B

Unit 4: Application Vulnerability

- 4.1 Show software based vulnerabilities (Badblue/iceblaster)
- 4.2 Web App Vulnerabilities (SQL Injection, Cross Site Scripting Etc)
- 4.3 Case Study on Software based Vulnerabilities (Badblue/iceblaster)

Unit 5: Active Directory

- 5.1** Introduction to Active Directory
- 5.2** Concept of OU, DC, TREE, FOREST
- 5.3** Concept of LDAP, Working of AD,
- 5.4** SMB, SPN

Unit 6: Cryptography

- 6.1** Introduction to Kerberos, Explain how Kerberos works
- 6.2 Explain Kerberoasting attack, Mention, ASREPROASTING, Golden Ticket.

- 6.3 Cryptography: Symmetric Encryption Algorithm, Asymmetric Encryption Algorithm,
 6.4 Hash Algorithm, Steganography, Prevention

Suggested Readings:

1. Jon Erickson, 2008, Hacking: The art of Exploitation, No Starch Press.
2. Peter Kim, 2013, The Hacker Playbook 2, Syngress

Note: Only latest editions of the books are recommended.

Web Links:

1. <https://www.geeksforgeeks.org/how-to-get-started-with-game-development/amp/>
2. <https://www.munotes.in/sem5techmaxgp.html>

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COURSE ARTICULATION MATRIX:

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MCA-CS-004.1	1	2	2		3		3						3	1
MCA-CS-004.2	2	3	1		2		2							
MCA-CS-004.3	1	3	2	1	2								2	2
MCA-CS-004.4	1			1	2		3						2	2
MCA-CS-004.5		1	2	1			2	3	2				2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-FSD-003: GAMING TECHNOLOGY-II

Periods/week Credits
L: 2 T: 2
Duration of Examination: 3 Hrs

Max. Marks : 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: Knowledge of any Programming Language and fundamentals of Multimedia.

Course Type: Domain Elective

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

MCA-FSD-003.1. Understand basic principles of Game Design and Game Design Process.

MCA-FSD-003.2. Understand importance of standards for good quality code and testing

MCA-FSD-003.3. Basics of display technology, Software Development Kit (SDK), Application Programming Interface (API).

MCA-FSD-003.4. Understand basic design guidelines for gaming application,

MCA-FSD-003.5. Industry wide best practices and various ways in game to grab inputs from various devices.

MCA-FSD-003.6. Develop a small game based on the learning.

PART- A

UNIT I: INTRODUCTION TO GAMING

- 1.1 Core Design: What Is a Game?
- 1.2 Gameplay meaning and creating the Game Specification
- 1.3 Initial Design: The Beginning.
- 1.4 Hardware Abstraction.
- 1.5 The Problem Domain.
- 1.6 Thinking in Tokens.

UNIT II: TECHNOLOGY

- 2.1 Use of Technology: The State of the Art.
- 2.2 Blue-Sky Research.
- 2.3 Reinventing the Wheel.
- 2.4 Use of Object Technology, Building Bricks: Reusability in Software
- 2.5 Initial Architecture Design: The Birth of Architecture.
- 2.6 The Tier System and Architecture Design.

UNIT III: DEVELOPMENT

- 3.1 The Development Process.
- 3.2 Code Quality and Coding Priorities.
- 3.3 Debugging
- 3.4 Module Completion.
- 3.5 The Seven Golden Gambits- The Three Lead Balloons.

Part B

UNIT IV: GAME PROGRAMMING

- 4.1 Game Programming Technologies
- 4.2 Display, Mixing 2D and 3D, DirectX,
- 4.3 User Interface code
- 4.4 Resource caching
- 4.5 Main loop.

UNIT V: DESIGN PRACTICES

- 5.1 Smart & naked pointers
- 5.2 Correct use of memory
- 5.3 Game scripting languages

- 5.4 User focus, Scenarios and Navigation Design
- 5.5 Screen Design, Prototyping techniques and Wire-Framing
- 5.6 Understanding the UI Layer and Its Execution Framework

UNIT VI: BUILDING YOUR GAME

- 6.1 Creating a project, source code repositories and version control,
- 6.2 Building the game and scripts,
- 6.3 User interface programming
- 6.4 input devices: Getting the Device State,
- 6.5 Working with the Mouse (and Joystick), Keyboard,
- 6.6 User Interface Components and more Control Properties.

Reference Books:

1. E. N. Barron, 2013, Game Theory: An Introduction, Wiley Student Edition.
2. Gary Rosenzweig, 2011, ActionScript 3.0 Game Programming University, Pearson Education.
3. Andrew Rollings and Dave Morris, 2003, "Game Architecture and Design", New Riders.
4. Mike McShaffry, 2003, "Professional Game Programming", Dreamtech Press.

Web Links:

1. <https://www.toptal.com/game/video-game-physics-part-i-an-introduction-to-rigid-body-dynamics>
2. <https://www.cgspectrum.com/blog/game-design-basics-how-to-start-building-video-games>

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COURSE ARTICULATION MATRIX:

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
MCA-FSD-003.1	3	2	2	1	2	2	1	1	1	2	2	2	2	1
MCA-FSD-003.2	3	3	2	2	2	2	1	1	2	2	2	2	2	1
MCA-FSD-003.3	3	2	2	2	2	2	2	1	2	2	2	2	2	2
MCA-FSD-003.4	3	3	2	2	2	2	2	1	2	2	2	2	2	3
MCA-FSD-003.5	3	2	2	2	2	2	2	1	1	2	2	2	2	3
MCA-FSD-003.6	3	3	2	3	2	2	2	1	2	3	3	1	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-FSD-004: ANGULAR

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Max. Marks: 200

Continuous Evaluation: 100

End Semester Examination: 100

Pre-Requisite: Basic Knowledge on HTML, CSS, BOOTSTRAP, JAVASCRIPT

Course Type: Domain Specific

Course Outcomes: At the end of the course, students will be able to

MCA-FSD-004.1 Develop modern, complex, responsive and scalable web applications with Angular

MCA-FSD-004.2 Use their gained, deep understanding of the Angular 4 fundamentals to quickly establish themselves as frontend developers.

MCA-FSD-004.3 Fully understand the architecture behind an Angular 4 application and how to use it.

MCA-FSD-004.4 Create single-page applications with one of the most modern JavaScript frameworks out there.

PART-A

Unit-1: Introduction to Angular

- 1.1. What is Angular
- 1.2. Difference between Angular 2.0 vs 7.0
- 1.3. Angular CLI and Troubleshooting
- 1.4. Node JavaScript Introduction
- 1.5. Setup a Project
- 1.6. Setup Node js with angular
- 1.7. Typescript Introduction
- 1.8. What is bootstrap
- 1.9. Create Your First App

Unit-2: Modules and Components

- 2.1. What is Component in Angular js
- 2.2. What is Module in Angular js
- 2.3. Create and Start Component
- 2.4. Why Components are important.
- 2.5. How we create a component
- 2.6. Create Component using CLI
- 2.7. What is nesting Component
- 2.8. What is Component Template
- 2.9. Component Styles and Selectors

Unit-3: Data Binding in Angular

- 3.1. What is Data binding
- 3.2. Splitting Application into Component
- 3.3. String Interpolation
- 3.4. What is Property Binding
- 3.5. Difference between Property Binding and String Interpolation
- 3.6. Binding with Custom Events.
- 3.7. What are Binding Properties and Events
- 3.8. Two Way binding
- 3.9. Combine Forms with Data binding
- 3.10. Custom Properties
- 3.11. What is Encapsulation
- 3.12. How to Use Local Reference in Templates Access and DOM
- 3.13. Component Lifecycle
- 3.14. What are Hooks in Angular js
- 3.15. Access Template with Hooks

PART-B

Unit-4: Directives in Angular js

- 4.1. What are Directives
- 4.2. Using Output Data Conditionally
- 4.3. What is ng if and else condition
- 4.4. Output List
- 4.5. Styling Element with ngStyle
- 4.6. How to apply CSS class dynamically with angular js
- 4.7. How to Create Basic Attribute Directive
- 4.8. What is Renderer
- 4.9. What is Host Binding and Host Listener
- 4.10. Directive Properties

Unit-5: Dependency Injection in Angular js

- 5.1. What is Dependency Injection
- 5.2. What are Services
- 5.3. Logging Service and Injection
- 5.4. Create Data Service
- 5.5. Instance of Services
- 5.6. Insert Service into Services
- 5.7. How to use service in Cross Component?
- 5.8. What is Hierarchical Injector

Unit-6: Angular Modules

- 6.1. What is idea behind Modules
- 6.2. What is feature Modules and how we create it
- 6.3. What are App Modules
- 6.4. Registering Routes in Feature Modules
- 6.5. What is Shared Module and how we create
- 6.6. Create the Auth Feature module

Suggested Readings:

1. Aristeidis Bampakos, Mark Thompson, 2021, Angular Projects: Build modern web apps by exploring Angular 12 with 10 different projects and cutting-edge technologies, Packet Publishing Ltd.
2. Muhammad Ahsan Ayaz, 2021, Angular Cookbook: Over 80 actionable recipes every Angular developer should know, Packet Publishing Ltd.

Note: Only latest editions of the books are recommended.

Web Links:

1. <https://www.tektutorialshub.com/angular-tutorial/>
2. <https://angular.io/guide/example-apps-list>
3. <https://www.javatpoint.com/angular-8>
4. https://www.w3schools.com/angular/angular_examples.asp

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-FSD-004.1.	3	2	1			2							1	1
MCA-FSD-004.2.		1		1			1	1	1	2			3	2
MCA-FSD-004.3.			3						1					
MCA-FSD-004.4.		3						1					3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-MC-003: AUTOMOTIVE COMPUTING

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluations: 100
End Semester Examination: 100

Pre-Requisite: Cloud Computing

Course Type: Domain Elective

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

MCA-MC-003.1 Demonstrate competency in the use of personal computers and business application software as required by the automotive industry.

MCA-MC-003.2. Describe data types, basic computer architecture and concepts, systems and components, and OEM/aftermarket automotive computer diagnostic systems.

MCA-MC-003.3. Demonstrate skills and knowledge of microcontrollers and microcontroller programming, and basic analog and digital signal acquisition and control.

MCA-MC-003. 4. Demonstrate analytical and critical reasoning skills for problem solving of automotive computing case studies.

MCA-MC-003.5. Demonstrate basic knowledge of data communications as applied to automotive technology.

PART-A

UNIT 1: Application Software on Personal Computers

- 1.1. Microsoft Word: Document-creating, Formatting, Finalizing
- 1.2. Microsoft Excel: Sheet-Creating, Formatting, Finalizing
- 1.3. Microsoft PowerPoint: Presentation-Creating, Finalizing
- 1.4. Microsoft Access: Database-Creating, Finalizing
- 1.5. Robotic systems and devices for health care and medicine
- 1.6. Technologies to promote a healthy and secure society

UNIT 2: Computer Basics

- 2.1. Data Types and Structures
- 2.2. Computer Hardware and Software
- 2.3. Operating Systems

UNIT 3: Microcontroller Basics

- 3.1. I/O Signals and Control
- 3.2. Memory (RAM/ROM/EEPROM)
- 3.3. Programming

PART-B

UNIT 4: Automotive Computer Diagnostic

- 4.1. OBD II and CAN Bus
- 4.2. OEM/Aftermarket Scan

UNIT 5: Automotive Hardware and Computing system

- 5.1. Introduction to modern hardware and computing systems
- 5.2. Hypervisor OS
- 5.3. Telematics Systems
- 5.4. Infotainment Systems
- 5.5. Smartphone Apps Integration

UNIT 6: Automotive Mobile Apps

- 6.1. Wireless networking
- 6.2. Mobile and wearable sensing
- 6.3. Multi-gigabit wireless networks

6.4. Internet of things

Suggested Readings:

1. Parsons & Oja, 2011, Practical Microsoft Office 2010: Text w/CD, (1st ed.), Cengage.
2. Matthew Gast, 2012, 802.11n: A Survival Guide, O'Reilly Media.
3. Matthew Gast, 2013, 802.11ac: A Survival Guide, O'Reilly Media.

Note: Only latest editions of the books are recommended.

Web links:

[Syllabus - CS 695-002 Wireless and Mobile Computing \(gmu.edu\)](#)

[Automotive-embedded-systems.pdf \(buffalo.edu\)](#)

[Role of Advanced Hardware and Software Platforms in the Automotive Industry \(einfochips.com\)](#)

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Sessional I	30%
Sessional II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-MC-003.1.	1	1		2			2	3		2		2	3	3
MCA-MC-003.2	3	3		2			3	3		2		2	2	
MCA-MC-003.3	1	1	3		2		3	3		2	3		2	1
MCA-MC-003.4	1	1	1	2	2		2	3			3		1	
MCA-MC-003.5	1	1		2			3	3		2	3			3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-MC-004: MOBILE GAMES

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Nil
Course Type: Domain Elective

COURSE OUTCOMES: If you complete the course successfully, you should be able to:

- MCA-MC-004.1 Knowledge of fundamental concepts of non-cooperative game theory.
- MCA-MC-004.2 The ability to apply solution concepts to examples of games, and to state and explain them precisely.
- MCA-MC-004.3 The ability to solve unseen games that are variants of known examples.

PART-A

Unit 1: Introduction to Game Theory

- 1.1 Game theory,
- 1.2 Theory of rational choice,
- 1.3 Interacting decision makers

Unit 2: Strategic Games and Nash Equilibrium

- 2.1 Strategic games: examples,
- 2.2 Nash equilibrium: concept and examples, Best response functions,
- 2.3 Dominated Actions, Symmetric games and symmetric equilibria,
- 2.4 Illustrations of Nash Equilibrium,
- 2.5 Cournot's model of duopoly market

Unit 3: Bertrand's model of duopoly market

- 3.1 Electoral Competition,
- 3.2 War of Attrition, Auctions,
- 3.3 Accident Laws

PART-B

Unit 4: Mixed Strategy Nash Equilibrium

- 4.1** Introduction, Strategic games with randomisation,
- 4.2** Mixed strategy Nash equilibrium: concept and examples
- 4.3 Dominated Actions,
- 4.4 Formation of Players' beliefs

Unit 5: Extensive Games and Nash Equilibrium

- 5.1 Introduction to extensive games,
- 5.2 Strategies and outcomes,
- 5.3 Nash equilibrium, Subgame perfect Nash equilibrium,
- 5.4 Backward induction

Unit 6: Illustrations of Extensive Games and Nash Equilibrium

- 6.1 Stackelberg model of duopoly markets,
- 6.2 Ultimatum game

Suggested Readings:

- 1. Osborne, M.J., 2004, An Introduction to Game Theory, Oxford University Press.
- 2. Mas-Colell, A., M.D. Whinston and J.R. Green, 1995, Microeconomic Theory, Oxford University Press.

Web links:

- 1. <https://www.geeksforgeeks.org/how-to-get-started-with-game-development/amp/>

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-MM-003: COMPOSITING & VISUAL EFFECTS

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Max. Marks : 100

Continuous Evaluation: 50

End Semester Examination: 50

Pre-Requisite: Multimedia

Course Type: Doman Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-MM-003.1. Understand the different toolset meant for multimedia

MCA-MM-003.2. Learn processing of 3_d images

MCA-MM-003.3. Get hands on experience in photographic applications of 3-D images

MCA-MM-003.4. Implement the effects on 3-D images using different techniques like rendering etc.

PART-A

UNIT 1: Introduction to Toolsets

- 1.1 Brief history of compositing and visual effects
- 1.2 Deconstructing digital images and the rendering process
- 1.3 Fundamental 3D and digital compositing principles
- 1.4 Comparing the Nuke and After Effects compositing engines
- 1.5 Pre-multiplied vs. non-pre-multiplied images Reading

UNIT 2: Photographic applications for 3D

- 2.1 Deconstructing cameras and the photographic process
- 2.2 Camerawork fundamentals
- 2.3 Aspect ratios, standards, focus, and exposure principles
- 2.4 Shooting and image processing for a background plate
- 2.5 Discuss perspective and depth cues

UNIT 3: Advanced photographic applications for 3D

- 3.1 Texture gathering
- 3.2 Limitations of standard low-dynamic range images
- 3.3 Shooting and Processing High Dynamic Range Images
- 3.4 Applications for HDRI in 3D Reading

PART-B

UNIT 4: Compositing 3D with Live Action

- 4.1 Setup and matching of 3D lighting to a background plate
- 4.2 Exporting multiple render passes and compositing for shadows
- 4.3 Image based lighting and reflections
- 4.4 Realistic materials
- 4.5 Ideal specifications for diffuse texturing
- 4.6 Contrasting game asset texturing to cinematic asset texturing

UNIT 5: Multi-pass Rendering

- 5.1 Using render layers to optimize multi-pass rendering
- 5.2 Multi layer compositing principles and techniques
- 5.3 Comparing basic effects and layered composite workflows
- 5.4 Diffuse, color, shadows, reflections, and occlusion
- 5.5 Advanced multi-Pass Rendering (specialty layers and channels, Z-Depth vs. Luminance depth, Image bit depth, 8-bit vs. 16 bit vs. floating point)
- 5.6 Node based compositing principles and techniques
- 5.7 Color correction and post effects

UNIT 6: Film, Video, Matting, and Chroma Keying

- 6.1 Deconstructing film, video, and digital video standards
- 6.2 Aspect ratios, file formats, and frame rates
- 6.3 Types of mattes and matting techniques
- 6.4 Chroma Keying , Making and mattes for 2D elements vs. 3D elements
- 6.5 Rotoscoping and wire removal
- 6.6 Matting Techniques for Particle Systems

Suggested Readings:

1. Mark Spencer, 2009, Apple Pro Training Series: Motion 4, Peachpit Press.
2. Damian Allen, 2007, Apple Pro Training Series: Motion 3, Peachpit Press.
3. Damian Allen, Brian Connor, 2006, Apple Pro Training Series: Encyclopedia of Visual Effects, Peachpit Press.
4. Jeffrey A. Okun and Susan Zwerman, 2020, The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures, Routledge.
5. Bill Byrne, 2009, The Visual Effects Arsenal: VFX Solutions for the Independent Filmmaker, Routledge.

Web Links:

1. [VFX Compositing & Visual Effects: After Effects Tutorials | Udemy](#)
2. [What Is Compositing in Video Editing? A Beginner's Guide - Storyblocks](#)

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-MM-003.1	1	1		2	3		3	2					3	3
MCA-MM-003.2	1	1	1	1	1		2	2			3		3	3
MCA-MM-003.3	1	1		1	2			2			3		2	3
MCA-MM-003.4	1		1		1		2	1			3		2	2

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-MM-004: MODELLING & TEXTURING

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: Multimedia
Course Type: Doman Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-MM-004.1 Ability to run after the box.

MCA-MM-004.2 To put together elements or parts so as to form a meaningful whole or new treatments and styles.

MCA-MM-004.3 Crisis management skills.

MCA-MM-004.4 Identify the situation

Part-A

Unit 1: Introduction to Media

1.1 Introduction to "Visual Communication" A brief History of animation

1.2 Development throughout the age

1.3 Different types of animation production,

1.4 Introduce the Production Methodology behind Animation film production

- I Pre-Production.
- II Production.
- III Postproduction

Unit 2: Object Modelling

2.1 Making the Object in BLENDER,

2.2 Add 'materials and shading',

2.3 Basics of "TEXTURING,UV Mapping",

2.4 Basics of "LIGHTING",

2.5 Basics of "RENDER AND COMPOSITING".

Unit 3: Character Modelling

3.1 Introduce different 'styles of characters used for animation and gaming,

3.2 Create own character,

3.3 Detailed Study on Character Design,

3.4 Clay Modelling methodology.

Part-B

Unit 4: Textures in 3D Model

4.1 Basics of Armature

4.2 3D Model of a proposed Character,

4.3 Experiment special features and mannerisms to character,

4.4 Identify the texture for developed characters, Deals with some procedural Textures

Unit 5: Blender 3D UVW

5.1 Learning Blender 3D UVW Maps and Unwrapping

5.2 A Mesh, lighting to character,

5.3 Compositing and Enhancement Phase.

Unit 6: BG modelling

6.1 Learn basic of "Perspective",

6.2 Environment Modelling,

6.3 develop an atmosphere.

6.4 3D UVW Maps and Unwrapping

6.5 A Mesh More experiments with TEXTURING AND SHADING OF REALISTIC BACK GROUNDS for animation, Practice rendering, compositing.

Suggested Readings:

1. David S. Ebert, F. Kenton Musgrave, Darwyn Peachey, 2003, Texturing and Modeling: A Procedural Approach (The Morgan Kaufmann Series in Computer Graphics, Morgan Kaufmann Publishers In
2. D. S. Ebert, 1998, Texturing and Modeling: A Procedural Approach, 2nd Ed., Academic Press Inc

Web Links:

1. <https://www.a23d.co/blog/what-is-3d-texturing/>
2. <https://www.oreilly.com/library/view/3d-animation-essentials/9781118147481/9781118239056c05.xhtml>

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Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-MM-004.1	3	3	2	2	3		3						2	1
MCA-MM-004.2	1	1	2	2	2		1						3	1
MCA-MM-004.3	1	2	2	1	2								2	1
MCA-MM-004.4	1	1	3	2	1		3						1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DS-216: ADVANCE DATABASE SYSTEMS

Periods/week Credits
L: 2 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Knowledge of Database Management System

Course Type: Domain Elective

Course Outcomes: At the end of the course, students will be able to:

MCA-DS-216.1 Understand the concept of Advance Database Base Management System.

MCA-DS-216.2 Explore the relational databases and its different models.

MCA-DS-216.3 Apply advance SQL queries and PL/SQL programs.

MCA-DS-216.4 Analyze the different database security issues.

MCA-DS-216.5 Create and implement the ER and EER diagrams.

PART -A

UNIT 1: Relational Database Design and Implementation

- 1.1 Introduction to Relational Database Management System
- 1.2 Features of Good Relational Database Management System
- 1.3 Enhanced ER tools
- 1.4 Converting EER diagram to tables
- 1.5 Different Table Constraints and Characterization
- 1.6 Normalization: UNF, 1NF, 2NF, 3NF, EKNF, BCNF, 4NF, ETNF, 5NF, DKNF, 6NF
- 1.7 Inclusion Dependencies and Template Dependency

UNIT 2: Emerging Database Technologies, Applications and Environments

- 2.1 Database Concepts and its Architecture
 - 2.1.1 Object Oriented Database
 - 2.1.2 Object Relational Database
 - 2.1.3 Active Database
 - 2.1.4 Temporal Database
 - 2.1.5 Spatial Database
 - 2.1.6 Deductive Database
 - 2.1.7 Mobile Database
- 2.2 Query Processing
- 2.3 Geographic Information System
- 2.4 Data Warehousing and Data Mining

UNIT 3: Advance SQL and PL/SQL

- 3.1 SQL Query Statements
- 3.2 Advance SQL Queries
- 3.3 SQL Operations: Selection, Join, Sorting, Grouping
- 3.4 Transformation of Relational and Logical Operations
- 3.5 SQL Functions
- 3.6 Storage and Query Optimization
- 3.7 Views and Query Processing
- 3.8 Cursors: Implicit and Explicit
- 3.9 Database Triggers
- 3.10 Exception Handling
- 3.11 Sub Programs: Procedures and Functions

PART-B

UNIT 4: Distributed Databases

- 4.1 Centralized versus non centralized Database
- 4.2 Homogeneous and Heterogeneous DDBMS and their comparison
- 4.3 Functions and Architecture
- 4.4 Distributed database design, query processing in DDBMS
- 4.5 Distributed concurrency management, deadlock management
- 4.6** Concepts of replication servers

UNIT 5: Database Security and Authorization

- 5.1 Introduction to Database Security
- 5.2 Problems in Database Security and Conclusions
- 5.3 Levels of Database Security
- 5.4 Access Control
- 5.5 Multilevel Security
- 5.6 Statistical Database Security
- 5.7 Examples of E-Security

UNIT 6: Transaction Management and Recovery Process

- 6.1 Advanced feature of Transactions
- 6.2 Enhanced Lock Based and timestamp-based Protocols
- 6.3 Deadlock Handling
- 6.4 Weak Levels of Consistency
- 6.6 Recovery and Atomicity
- 6.7 Recovery with Concurrent Transaction
- 6.8 Advanced Recovery Techniques
- 6.9 Remote Backup Systems

Suggested Readings:

1. Elmasri and Navathe, 2016, Fundamentals of Database Systems, Pearson Education
2. Raghu Ramakrishnan, 2003, Database Management Systems, Johannes Gehrke, , McGraw-Hill
3. Korth, Silberchatz, Sudarshan, 2011, Database System Concepts, McGraw-Hill.
4. Peter Rob and Coronel, 2010, Database Systems, Design, Implementation and Management, Thomson Learning.
5. C. J. Date & Longman, 2003, Introduction to Database Systems, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Oracle 9i or above versions (10g, 11i, 12c)

<https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/>

https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm

<https://www.tutorialspoint.com/html/index.htm>

<https://www.w3schools.com/>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-216.1		1	2	3		2		2		3	3		3	2
MCA-DS-216.2	1	2	2	3	3	3		2	2		3		2	1
MCA-DS-216.3	1	1	2		2		2		3		2	2	2	2
MCA-DS-216.4		3	2	3			2			3			2	3
MCA-DS-216.5	1	1	2		2				2	3			2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-DS-217: SOCIAL NETWORK ANALYTICS

Periods/week Credits
L: 2 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic Knowledge on C Programming, Sensors, Microcontrollers

Course Type: Domain Elective

Course Outcomes: At the end of the course, students will be able to:

MCA-DS-217.1. Do Online interactive demonstrations and hands-on analysis of real-world data sets

MCA-DS-217.2. Analyse the structure and evolution of networks

PART-A

Unit-1: Introduction

- 1.1 Social network data-Formal methods-
- 1.2 Paths and Connectivity-Graphs to represent social relations-
- 1.3 Working with network data-
- 1.4 Network Datasets-Strong and weak ties - Closure, Structural.

Unit-2: Social Influence

- 2.1 Homophily- Mechanisms Underlying Homophily,
- 2.2 Selection and Social Influence, Affiliation,
- 2.3 Tracking Link Formation in On-Line Data,
- 2.4 Spatial Model of Segregation –
- 2.5 Positive and Negative Relationships - Structural Balance - Applications of Structural Balance, Weaker Form of Structural Balance.

Unit-3 Information Networks and The World Wide Web

- 3.1 The Structure of the Web-World Wide Web-
- 3.2 Information Networks, Hypertext
- 3.3 Associative Memory- Web as a Directed Graph,
- 3.4 Bow-Tie Structure of the Web-Link Analysis
- 3.5 Web Search Searching the Web: Ranking

PART-B

Unit-4: Information Networks and The World Wide Web

- 4.1 Link Analysis using Hubs and Authorities-
- 4.2 Page Rank-
- 4.3 Link Analysis in Modern Web Search, Applications,
- 4.4 Spectral Analysis, Random Walks, and Web Search.

Unit-5: Social Network Mining

- 5.1 Clustering of Social Network graphs: Betweenness, Girvan Newman Algorithm-
- 5.2 Discovery of communities-
- 5.3 Cliques and Bipartite Graphs-Graph Partitioning Methods-
- 5.4 Matrices-Eigen values Sim-rank

Unit-6: Network Dynamics

- 6.1 Cascading Behaviour in networks: Diffusion in Networks,
- 6.2 Modelling Diffusion-Cascades and Cluster,
- 6.3 Thresholds, Extensions of the Basic Cascade Model-
- 6.4 Six Degrees of Separation-Structure and Randomness,

6.5 Decentralized Search- Empirical Analysis and Generalized Models-

6.6 Analysis of Decentralized Search.

Suggested Readings:

1. Easley and Kleinberg, 2010, Networks, Crowds, and Markets: Reasoning about a highly connected world, Cambridge Univ. Press.
2. Robert A. Hanneman and Mark Riddle, 2005, Introduction to social network methods, University of California.
3. Jure Leskovec, Anand Rajaraman, Millway Labs, Jeffrey D. Ullman, 2014, Mining of Massive Datasets, Cambridge University Press.

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.tutorialride.com/big-data-analytics/social-network-analysis.htm>

https://aberdeenstudygroup.github.io/studyGroup/lessons/SG-T21-SocialNetworkAnalysis/SNA_tutorial/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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Sessional-II	30%
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Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-217.1.	3	3			2	2						1		
MCA-DS-217.2.		2		3		1		3				2		1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-IOT-003: COMMUNICATION TECHNOLOGIES IN IoT

Periods/week Credits
L: 2 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Basic Knowledge on C Programming, Sensors, Microcontrollers

Course Type: Domain Specific

Course Outcomes: At the end of the course, students will be able to

MCA-IOT-003.1. Understand the fundamentals of IOTs.

MCA-IOT-003.2. Know the concept of simulation of IoT environment

MCA-IOT-003.3. Learn the technologies of Interfacing sensors with IoT Environment

MCA-IOT-003.4. Be exposed to various Communication protocols in IoT

PART-A

Unit-1: Introduction to IOT

- 1.1. Understanding IoT fundamentals
- 1.2. IOT Architecture and protocols
- 1.3. Various Platforms for IoT
- 1.4. Real time Examples of IoT
- 1.5. Overview of IoT components and IoT Communication Technologies
- 1.6. Challenges in IOT

Unit-2: Arduino Simulation Environment

- 2.1. Arduino Uno Architecture
- 2.2. Setup the IDE, Writing Arduino Software
- 2.3. Arduino Libraries
- 2.4. Basics of Embedded C programming for Arduino
- 2.5. Interfacing LED, push button and buzzer with Arduino
- 2.6. Interfacing Arduino with LCD

Unit-3: Sensor & Actuators with Arduino

- 3.1. Overview of Sensors working
- 3.2. Analog and Digital Sensors
- 3.3. Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino
- 3.4. Interfacing of Actuators with Arduino.
- 3.5. Interfacing of Relay Switch and Servo Motor with Arduino

PART-B

Unit-4: Basic Networking with ESP8266 WiFi module

- 4.1. Basics of Wireless Networking
- 4.2. Introduction to ESP8266 Wi-Fi Module
- 4.3. Various Wi-Fi library
- 4.4. Web server- introduction, installation, configuration
- 4.5. Posting sensor(s) data to web server

Unit-5: IoT Protocols

- 5.1. M2M vs. IOT
- 5.2. Communication Protocols
- 5.3. M2M and WSN Protocols
- 5.4. SCADA and RFID Protocols
- 5.5. Issues with IoT Standardization

- 5.6. Unified Data Standards
- 5.7. Protocols – IEEE802.15.4
- 5.8. BACNet Protocol

Unit-6 . Cloud Platforms for IOT

- 6.1. Virtualization concepts and Cloud Architecture
- 6.2. Cloud computing, benefits
- 6.3. Cloud services -- SaaS, PaaS, IaaS
- 6.4. Cloud providers & offerings
- 6.5. Study of IOT Cloud platforms
- 6.6. ThingSpeak API and MQTT
- 6.7. Interfacing ESP8266 with Web services

Suggested Readings:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011.
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applicationsand Protocols", Wiley, 2012.

Note: Only latest editions of the books are recommended.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-IOT-003.1.	3	3			2	2						1		
MCA-IOT-003.2.		2	2	3		1		3				2		1
MCA-IOT-003.3.					1		2			2	3		1	
MCA-IOT-003.4.	1			1					2					2

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-IoT-004: SOFTWARE & PROGRAMMING IN IoT

Periods/week	Credits	Max. Marks	: 200
L: 2	2	Continuous Evaluation:	100
Duration of Examination:	3 Hrs	End Semester Examination:	100

Co-Requisite: Computer networks

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-IoT-004.1. Able to understand the pros of IoT in modern day life

MCA-IoT-004.2. Learn programming in microcontroller

MCA-IoT-004.3. Get hands on experience in designing various IoT applications

MCA-IoT-004.4. Design some IoT based prototypes

PART-A

UNIT 1: Introduction to IoT

- 1.1 Understanding the IoT fundamentals
- 1.2 IoT architecture and protocols
- 1.3 Various platforms for IoT
- 1.4 Real time examples of IoT
- 1.5 Overview of IoT components and IoT communication Technologies
- 1.6 Challenges in IoT

UNIT 2: Interaction with Arduino

- 2.1 Arduino Simulation Environment
- 2.2 Arduino Uno Architecture
- 2.3 Setup the IDE, Writing Arduino Software
- 2.4 Arduino Libraries
- 2.5 Basics of Embedded C programming for Arduino
- 2.6 Interfacing LED, push button

UNIT 3: Programming with Arduino

- 3.1 Sensor and Actuators with Arduino
- 3.2 Overview of Sensors working
- 3.3 Analog and Digital Sensors
- 3.4 Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino
- 3.5 Interfacing of Actuators with Arduino.
- 3.6 Interfacing of Relay Switch and Servo Motor with Arduino

PART-B

UNIT 4: Interaction with Raspberry Pi

- 4.1 Interfacing Hardware with the Raspberry Pi
- 4.2 Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface
- 4.3 Introduction to Cloud Storage models and communication APIs.
- 4.4 Web server & cloud for IoT
- 4.5 Python web application framework
- 4.6 Designing a RESTful web API via connecting to APIs

UNIT 5: Designing through Raspberry Pi

- 5.1 IoT Design using Raspberry Pi IoT Applications based on Pi
- 5.2 LAMP Web-server, GPIO Control over Web Browser

- 5.3 Creating Custom Web Page for LAMP
- 5.4 Communicating data using on-board module
- 5.5 Home automation using Pi, Node-RED, MQTT Protocol
- 5.6 Using Node-RED Visual Editor on Rpi

UNIT 6: Networking with Arduino & Rasberry Pi

- 6.1 Basic Networking with ESP8266 WiFi module & Wireless Networking
- 6.2 Introduction to ESP8266 Wi-Fi Module
- 6.3 Web server- introduction, installation, configuration
- 6.4 Posting sensor(s) data to web server 5. Cloud Platforms for IOT
- 6.5 Virtualization concepts and Cloud Architecture alongwith the benefits of cloud computing
- 6.6 Cloud services -- SaaS, PaaS, IaaS & Interfacing ESP8266 with Web services

Suggested Readings:

- 1. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web, Wiley Publications
- 2. Olivier Hersent, David Boswarthick, and Omar Elloumi, — "The Internet of Things: Key Applications and Protocols", Wiley Publications
- 3. Vijay Madiseti and Arshdeep Bahga, 2014, "Internet of Things (A Hands-on-Approach)", VPT.
- 4. J. Biron and J. Follett, 2016, "Foundational Elements of an IoT Solution", O'Reilly Media.
- 5. Keysight Technologies, 2016, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note.
- 6. Daniel Minoli, 2013, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Willy Publications.
- 7. Pethuru Raj and Anupama C. Raman, 2017, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press.

Web Links:

https://onlinecourses.nptel.ac.in/noc17_cs22/course 4. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
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COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-IOT-004.1	1	1	2	2	3		3	2					3	3
MCA-IOT-004.2	1	1	1	1	1		2	2			3		3	3
MCA-IOT-004.3	1	1		1	2		2	2			3		2	3
MCA-IOT-004.4	1		1	1	1		2	1			3		2	2

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DaS-003: DATA ANALYTICS AND VSUALIZATION USING EXCEL

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 200

Continuous Evaluations: 100

End Semester Examination: 100

Pre-Requisite: Basics of MS-EXCEL

Course Type: Elective

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

MCA-DaS-003.1. Generate spreadsheets with appropriate formatting, layout, proofing.

MCA-DaS-003.2. Draw analysis on data using spreadsheets and use interpretation.

MCA-DaS-003.3. Make meaningful representations of data in the form of charts and pivot tables.

MCA-DaS-003.4. Develop ability to deal with numerical and quantitative problems in workbooks.

MCA-DaS-003.5. Effectively use the analytics and visualisation tools in Spreadsheets.

PART-A

UNIT 1: Introduction to Excel

- 1.1 MS excel screen elements – Tool bar, title bar, ribbon, formula bar, status bar.
- 1.2 Moving around a Worksheet,
- 1.3 Entering and formatting (e.g. Number, Text, Date and Currency) data.
- 1.4 Cell referencing (relative, absolute, mixed),
- 1.5 Using formulae,
- 1.6 Use of Find, Replace, Goto.

UNIT 2: Working with Excel

- 2.1 Insert, delete - cells, rows, columns.
- 2.2 Sorting (basic, custom),
- 2.3 Filtering, grouping, ungrouping data,
- 2.4 Dealing with subtotals and grand totals.
- 2.5 Validating data, protecting cells
- 2.6 Pivot Tables.

UNIT 3: Conditional Formatting with Excel

- 3.1 Recording Macros, Absolute and relative macros, editing macros
- 3.2 Use of spinner buttons and command buttons;
- 3.3 Sub Procedure, Function Procedure
- 3.4 If_Then_Else; Simple If Function Nested Functions
- 3.5 Working with Loops: Do_while loop, For_Next loop;
- 3.6 Creating User Forms: Message Box, Input Box

PART-B

UNIT 4: Functions in Excel

- 4.1 Formula Functions – Sum, Average, if, Count, max, min
- 4.2 Date and Time Functions
- 4.3 Financial Functions
- 4.4 Logical Functions
- 4.5 Lookup and Reference Functions
- 4.6 Math and Trigonometry Functions
- 4.7 Statistical Functions

4.8 Text Functions

UNIT 5: Data Representation in Excel

- 5.1 Creating Charts
- 5.2 Editing a Chart- Changing the Chart Type and Orientation of the Data Series
- 5.3 Editing chart Titles, Legend and Gridlines,
- 5.4 Moving and resizing the embedded chart.
- 5.5 Create and Manage Pivot Tables
- 5.6 Create and Manage Pivot Charts

UNIT 6: Data Viewing and Reviewing in Excel

- 6.1 Data Viewing and Reviewing
- 6.2 Inserting comments,
- 6.3 Spell checks
- 6.4 Manipulation to the worksheet data etc,
- 6.5 Viewing data in different ways eg. Page break, normal etc

Suggested Readings:

1. Michael Alexander, Dick Kusleika, Excel 2016 Power Programming with VBA, Wiley
2. Chandan Sengupta, Financial Analysis and Modelling Using Excel and VBA, Second Edition, Wiley Student Edition.
3. Wayne Winston, MS Excel 2016, Data Analysis• & Business Modelling, PHI.

Note: Only latest editions of the books are recommended.

Web links:

- Excel Data Analysis - Data Visualization (tutorialspoint.com)
- Data Visualization in Excel - GeeksforGeeks

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COURSE ARTICULATION MATRIX:

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MCA-DaS-003.1.	1	1		2			2	3				2	3	3
MCA-DaS-003.2	3	3		2			3	3				2	2	
MCA-DaS-003.3	1	1	3		2		3	3					2	1
MCA-DaS-003.4	1	1	1	2	2		2	3					1	
MCA-DaS-003.5	1	1		2			3	3		2	3			3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DaS-004: DATA ANALYTICS & VISUALIZATION USING PYTHON

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 200

Continuous Evaluations : 100

End Semester Examination: 100

Pre-Requisite: Basics of Python Programming

Course Type: Elective

MCA-DaS-004.1. Generate Python scripts for data analysis with appropriate documentation.

MCA-DaS-004.2. Apply Python libraries for data analysis and interpretation.

MCA-DaS-004.3. Create data visualizations using Python libraries such as Matplotlib and Seaborn, and effectively use charts and pivot tables for data representation.

MCA-DaS-004.4. Analyze and solve numerical and quantitative problems using Python's data analysis and manipulation tools.

MCA-DaS-004.5. Apply advanced data analytics and visualization techniques to solve real-world problems.

PART-A

UNIT 1: Introduction to Data Analytics and Python

1.7 Introduction to Data Analytics

1.8 Python Basics for Data Analysis

1.9 Data Structures in Python (Lists, Dictionaries, etc.)

1.10 Control Structures and Functions

UNIT 2: Data Manipulation with Python

2.7 Pandas Library for Data Manipulation

2.8 Data cleaning and Preprocessing

2.9 Handling Missing Data

2.10 Data Aggregation and Grouping

UNIT 3: Data Visualization

3.7 Introduction to Data Visualization

3.8 Types of Data Visualizations

3.9 Role of Data Visualization in Data Analysis

3.4 Principles of Effective Data Visualization in Data Analysis

3.5 Python Libraries for Data Visualization

PART-B

UNIT 4: Introduction to Matplotlib

4.9 Matplotlib for Static Visualizations

4.10 Creating Line Plots with Matplotlib

4.11 Scatter Plots and Customization with Matplotlib

4.12 Generating Bar Charts and Histograms

4.13 Interactive Visualizations with Plotly

UNIT 5: Seaborn for Enhanced Data Visualization

5.1 Introduction to Seaborn

5.2 Creating Statistical Visualizations with Seaborn

5.3 Utilizing Seaborn Themes and Color Palettes

5.4 Advanced Visualizations with Seaborn

UNIT 6: Creating Custom Visualizations

- 6.1 Combining Matplotlib and Seaborn
- 6.2 Creating Subplots and Layouts
- 6.3 Adding Annotations and Text to Visualizations
- 6.4 Interactive Visualizations with External Libraries

Suggested Readings:

1. Charles Severance, 2022, "Python for Everybody: Exploring Data in Python 3," www.py4e.com
2. Wes McKinney, 2017, "Python for Data Analysis," O'Reilly Media
3. Jake VanderPlas, 2016, "Python Data Science Handbook," O'Reilly Media

Note: Only latest editions of the books are recommended.

Web links:

- Packages of Data Visualization in Python - Javatpoint
- Introduction to Data Visualization in Python (gilberttanner.com)
- Data Visualization with Python - GeeksforGeeks

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

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MCA-DaS-004.1.	1	1		2			2	3				2	3	3
MCA-DaS-004.2	3	3		2			3	3				2	2	
MCA-DaS-004.3	1	1	3		2		3	3					2	1
MCA-DaS-004.4	1	1	1	2	2		2	3					1	
MCA-DaS-004.5	1	1		2			3	3		2	3			3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-BC-003: BLOCKCHAIN ARCHITECTURE

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation : 100
End Semester Examination : 100

Pre-Requisite: Fundamentals of Blockchain

Course Type: Domain Elective

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

MCA-BC-003.1. Understand the concept of Blockchain

MCA-BC-003.2. Study about consensus protocols

MCA-BC-003.3. Understand Hyperledger fabric

MCA-BC-003.4. Implement the blockchain in financial software system and trade supply chain

PART-A

Unit 1: Introduction to Blockchain

- 1.1 Digital Money to Distributed Ledgers
- 1.2 Design Primitives: Protocols, Security, Consensus, Permissions, Privacy
- 1.3 Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature
- 1.4 Hash chain to Blockchain, Basic consensus mechanisms

Unit 2: Consensus

- 2.1 Requirements for the consensus protocols
- 2.2 Proof of Work (PoW)
- 2.3 Scalability aspects of Blockchain consensus protocols
- 2.4 Permissioned Blockchains: Design goals
- 2.5 Consensus protocols for Permissioned Blockchains

Unit 3: Hyperledger Fabric

- 3.1 Hyperledger Fabric: Decomposing the consensus process
- 3.2 Hyperledger fabric components
- 3.3 Chain code Design and Implementation
- 3.4 Hyperledger Fabric : Beyond Chaincode: Fabric SDK and Front End
- 3.5 Hyperledger composer tool

PART-B

Unit 4: Implementation

- 4.1 OOPS concept of Python
- 4.2 Encryption technique
- 4.3 Block encryptio
- 4.4 Interface/ API of Blockchain
- 4.5 Blockchain implementation using Python/ Java

Unit 5: Use Case

- 5.1 Use case 1 : Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets.
- 5.2 case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc.

Unit 6: Use Case3

- 6.1 Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems
- 6.2 Blockchain Cryptography
- 6.3 Privacy and Security on Blockchain

Suggested Readings:

- 1. Andreas Antonopoulos, 2014, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, O'Reilly Media.
- 2. Melanie Swa, 2015, Blockchain, O'Reilly.
- 3. Bob Dill, David Smits, 2017, Zero to Blockchain – An IBM Redbooks course.

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.javatpoint.com/blockchain-tutorial>

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Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Tools:

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-BC-003.1	2		1	2	1		2			1			3	1
MCA-BC-003.2	1			1			3	1		1	2	1	2	
MCA-BC-003.3	2		2		1	1			1		2		2	
MCA-BC-003.4	1		1	2			3	1	3		2		3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-BC-004: BLOCKCHAIN AND SMART CONTRACTS

Periods/week Credits

L :2 T: 0 2.0

Duration of Exam: 3 Hrs

Max. Marks: 200

Continuous Evaluation: 100

End Semester Examination: 100

Pre-Requisite: Expertise in programming, basic knowledge of computer security, cryptography, networking, concurrent or parallel programming would help a student to understand the topics.

Course Type: Domain Elective

Course Outcomes: Students will be able to –

MCA-BC-004.1 Make the students familiar with such emerging technologies.

MCA-BC-004.2 Understand the cryptographic concept behind the Block chain technology.

MCA-BC-004.3 Understand and learn the use cases and aspects of Block chain with implementation options.

PART –A

UNIT 1: Introduction:

- 1.1 Course objectives and outcomes
- 1.2 What is Ethereum? How does Ethereum compare to Bitcoin?
- 1.3 The Ethereum network and History of Ethereum
- 1.4 Background Theories: Cryptographic Hash Functions (SHA), Cryptographically Secured, Digital Signature, Public Key Cryptography (RSA),
- 1.5 Chain of Blocks, Merkle Trees, Smart Contract, Centralized Vs. Distributed network. Actors and components in Blockchain solution

UNIT 2: Smart Contracts, Dapps, And DAOs (concepts):

- 2.1 What are Smart Contracts?
- 2.2 What is Ethereum Virtual Machine (EVM)?
- 2.3 What is Decentralized Autonomous Organizations (DAO)?
- 2.4 Quick Start Overview of Remix using JavaScript VM

UNIT 3: Ethereum Technology Overview

- 3.1 Architectural Overview
- 3.2 Ethereum Block chain Platform
- 3.3 Ethereum Virtual Machine
- 3.4 Create your private Ethereum block chain
- 3.5 Download the main Ethereum block chain
- 3.6 Analyze Ethereum block chain

PART – B

UNIT 4: Introduction to Programming Smart Contracts

- 4.1 A Simple Smart Contract
- 4.2 Account Types, Gas, and Transactions
- 4.3 Contracts
- 4.4 Accessing Contracts and Transactions
- 4.5 Developer Tools and Ethereum Tests
- 4.6 Web3 Base Layer Services

UNIT 5: – Programming Tutorial - Installing, Building, Testing, & Deploying

- 5.1 Ethereum Nodes
- 5.2 Building A Private Blockchain Network
- 5.3 MetaMask Browser Plug In

- 5.4 Mist Browser
- 5.5 Ethereum Wallet
- 5.6 Web3 Ethereum JavaScript API

UNIT 6: Decentralized Apps (Dapps)

- 6.1 Connecting to the Blockchain and Smart Contract
- 6.2 Web3js
- 6.3 Deployment
- 6.4 Sample Web Pages (HTML/CSS/Javascript)

Suggested Books:

- 6.6.1.1.1.1 Imran Bashir, 2023, Mastering Blockchain, Packt Publishing
- 6.6.1.1.1.2 Matt Zand, 2021, Hands-On Smart Contract Development with Hyperledger Fabric V2, O'Reilly Media

Note: Only latest editions of the books are recommended.

- <https://www.geeksforgeeks.org/smart-contracts-in-blockchain/>
- <https://www.simplilearn.com/tutorials/aws-tutorial/aws-load-balancer>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

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Assessment Tools:

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Course Articulation Matrix:

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MCA-BC-004.1	1		1	2			2						3	3
MCA-BC-004.2	1	2	1		3		1						2	2
MCA-BC-004.3			2	1		2	1							

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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MCA-DO-003: DEVOPS SOFTWARE ENGINEERING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 100

End Semester Examination: 100

Pre-Requisite: Software Engineering

Course Type: Domain Elective

Course Outcomes: At the end of the course, students will be able to

MCA-DO-003.1. Apply configuration management to production environments.

MCA-DO-003.2. Maintain test suites and measure testing quality and coverage

MCA-DO-003.3. Automatically generate new tests, using feedback-directed random testing, fuzzing, and data-flow analysis

MCA-DO-003.4. Programmatically measure code quality via static and dynamic code analysis

MCA-DO-003.5. Apply advanced strategies for deployment of software.

PART-A

Unit 1: Introduction to DevOps in Software Engineering

1.1 Introduction to DevOps and importance in Software Development

1.2 DevOps and Software Development Life Cycle

1.3 Agile Model

1.4 Continuous Integration & Deployment

Unit 2: Version Control System

2.1 Purpose of Version Control System

2.2 Types of Version Control System

2.3 Centralized vs Distributed Version Control

2.4 Version Control tools

2.5 Overview of GIT

Unit 3: Introduction to Agile

3.1 Agile methodologies

3.2 Agile Requirements

3.3 Scaled agile frameworks

3.4 Agile forecasting and project Management

3.5 Agile tracking tools

PART -B

Unit 4: Azure DevOps

4.1 Azure DevOps Test Plan

4.2 Pipelines and artifacts

4.3 Introduction of Azure DevOps Server

4.4 Application of Azure DevOps

Unit 5: Testing Tools

5.1 Introduction to Testing Tools

5.2 Selenium Agile Testing

5.3 Jira

5.4 Junit

Unit 6: DevOps on Cloud

- 6.1 Essentials of Cloud computing
- 6.2 Cloud and virtualization architecture
- 6.3 Cloud deployment architecture
- 6.4 Cloud providers – An overview
- 6.5 Why we need DevOps on Cloud?

Suggested Readings:

1. Sricharan Vadapalli, 2018, DevOps: Continuous Delivery, Integration, and Deployment with DevOps: Dive, Packt.
2. Thomas Uphill, John Arundel, Neependra Khare, Hideto Saito, Hui-Chuan, 2017, DevOps: Puppet, Docker, and Kubernetes, Packt.
3. Janet Gregory, Lisa Crispin, More Agile Testing: Learning Journeys for the Whole Team, Addison Wesley.

Note: Only latest editions of the books are recommended.

Weblinks:

<https://www.geeksforgeeks.org/git-tutorial/>

<https://www.geeksforgeeks.org/difference-between-software-engineer-and-devops-engineer/>

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Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

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MCA-DO-003.1	3	2	2	3	2	1	2	2			1	3	2	2
MCA-DO-003.2	3	1	1	3	2	1	2	1			2	3	2	2
MCA-DO-003.3	3	2	1	3	2	1	1	2			2	3	2	2
MCA-DO-003.4	2	3	2	3	1	1	2	2			3	3	2	2
MCA-DO-003.5	1	2	1	2	2	1	2	2			3	3	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-DO-004: CONTINUOUS INTEGRATION & VERSION CONTROL

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs
100

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination:

Pre-Requisite: Knowledge of Software Development

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-DO-004.1 Define the concept of version control.

MCA-DO-004.2 Describe working principles of GIT repository and how to use them in real world projects.

MCA-DO-004.3 Explain workflows and record changes to repository.

MCA-DO-004.4 Make and track changes in a GIT.

MCA-DO-004.5 create a GIT and use it.

PART -A

Unit 1: Introduction to Version Controlling Tool

- 1.1 Knowing about Version control
- 1.2 Essentials of GIT in Industry
- 1.3 How to setup GIT
- 1.4 Working with various commands in GIT
- 1.5 Recording Changes to the Repository

Unit 2: Working with GIT

- 2.1 Viewing the Commit History
- 2.2 Undoing Things
- 2.3 Working with Remotes
- 2.4 Branching and Merging in Git
- 2.5 GIT workflows
- 2.6 GIT cheat sheet

Unit-3: Essentials of Continuous Integration (Jenkins)

- 3.1 Essentials of Continuous Integration
- 3.2 An example scenario where CI is used
- 3.3 Know about Jenkins and its architecture in detail
- 3.4 Jenkins tool Management in detail
- 3.5 Know about User management in Jenkins
- 3.6 Authentication
- 3.7 Authorization

PART-B

Unit 4: Creating jobs and automatic build settings

- 4.1 What is Jenkins Pipeline?
- 4.2 Why Pipeline?
- 4.3 Integration with GIT
- 4.4 How to enable project-based authorization for a job
- 4.5 Source code management while creating jobs

Unit 5: Docker

- 5.1 Real-world Shipping Transportation Challenges
- 5.2 Introducing Docker and its technology
- 5.3 Understanding of Docker images and containers

- 5.4 Working with container
- 5.5 How to Share and copy a container
- 5.6 Container Life Cycle
- 5.7 How to use Base Image and customize
- 5.8 Creation of Docker File
- 5.9 How to Publish Image on Docker Hub

Unit 6: Introduction to Docker Networking

- 6.1 Network Types in docker technology
- 6.2 Docker Container Networking
- 6.3 Docker Compose – An introduction
- 6.4 Docker Swarm – An introduction
- 6.5 Use Docker Compose to create php, wordpress, mysql
- 6.6 How to Start Containers on a Cluster with Docker Swarm
- 6.7 Creating and Scaling an application in Docker swarm

Suggested Readings:

- 1. Scott Chacon and Ben Straub, 2021, Pro GIT Everything you need to know about GIT, Apress
- 2. Raju Gandhi, 2022, Head First Git: A Learner's Guide to Understanding Git from the Inside Out, Paperback
- 3. Silverman Richard E., 2020, Git Pocket Guide, O'Reilly

Note: Only latest editions of the books are recommended.

Web links:

- <https://www.tutorialspoint.com/continuous-integration/continuous-integration-version-control.htm>
- <http://www.w3schools.me/devops/devops-tutorial>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
MCA-DO-004.1	2		1	1			2						3	3
MCA-DO-004.2	1	3	1		1		1						2	2
MCA-DO-004.3	1	2	2	2		2	1						2	3
MCA-DO-004.4	1	2	2	2	3	2	1						3	2
MCA-DO-004.5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

MCA-CN-003: NETWORK PROTOCOLS

Periods/week Credits
L: 2 2
Duration of Examination: 3 Hrs

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Data Communication & Networking

Course Type: Domain Specific

Course Outcomes: At the end of the course, students will be able to

MCA-CN-003.1. Learn basics of Network Protocols.

MCA-CN-003.2. Understand the concepts of different protocols over Data Link layer and MAC layer.

MCA-CN-003.3. Classify and utilize the details of IP addresses and the functions of different routing protocols.

MCA-CN-003.4. Analyze different protocols require to be configured in networks for reliable transmission.

MCA-CN-003.5. Understand the purpose of application layer services and protocols.

PART –A

UNIT 1: Network Protocols: Basics and Foundations

- 1.1 Introduction to Network Protocols
- 1.2 Protocols and Standards
- 1.3 Protocol Stack Architecture
- 1.4 Network Protocol Analyzer
- 1.5 TCP/IP Protocol Suite

UNIT 2: Data Link Layer Protocols

- 2.1 Utopian Simplex Protocol
- 2.2 Stop and Wait Protocol for error free and noisy channel
- 2.3 Sliding window protocol
- 2.4 SONET
- 2.5 ADSL

Unit 3: Multiple Access Protocols

- 3.1 ALOHA
- 3.2 CSMA Protocols
- 3.3 Collision free Protocols
- 3.4 Limited Contention Protocols
- 3.5 Wireless LAN Protocols

PART-B

UNIT 4: Network Layer Protocols

- 4.1 Routing Protocols
- 4.2 Internet Protocol (IPv4 & IPv6)
- 4.3 Internet Control Protocols (ICMP & IGMP)
- 4.4 ARP & RARP

UNIT 5: Transport Layer Protocols

- 5.1 Elements of Transport Protocol
- 5.2 TCP & UDP
- 5.3 Real Time Transport Protocol
- 5.4 Protocol for Long Fat Networks
- 5.5 Bundle Protocol for Delay Tolerant Networks

UNIT 6: Application Layer Protocols

- 6.1 HTTP & HTTPs
- 6.2 SMTP
- 6.3 FTP
- 6.4 DNS
- 6.5 SNMP
- 6.6 Telnet

Suggested Readings:

1. B. Forouzan, 2017, Data Communication and Networking, Tata McGraw Hill.
2. A.S. Tanenbaum, 2016, Computer networks, Prentice Hall.
3. Tomasi Wayne, 2007, Introduction to Data Communication & Networking, Pearson Education
4. 1993, Protocol Standards and Interfaces, Computer networks, Black, Prentice Hall Education

Note: Only latest editions of the books are recommended.

Weblinks:

<https://www.smartzworld.com/notes/computer-network-cn-notes-pdf> <https://www.tutorialspoint.com>
www.tutorialspoint.com/listtutorials/networking/1

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional I	30%
Sessional II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CN-003.1		2		1		1	3						2	1
MCA-CN-003.2	2	2	2				3			1			3	2
MCA-CN-003.3		3		1			2						2	
MCA-CN-003.4	2	3			1		2		1		1		1	2
MCA-CN-003.5	2	1	1		2		3			1				

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

MCA-CN-004: TCP/IP

Periods/week Credits
L: 2 T: 0 2
Duration of Examination: 3 Hrs.

Max. Marks: 200
Continuous Evaluation: 100
End Semester Examination: 100

Pre-Requisite: Computer Networks
Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:
MCA-CN-004.1 Summarize basic principles of IPv4 and its Addressing mechanisms.
MCA-CN-004.2 Understand UDP Services and Applications in Transport Layer.
MCA-CN-004.3 Describe the services, and features of TCP.
MCA-CN-004.4 Discuss various Flow, Error and Congestion control mechanisms of TCP.
MCA-CN-004.5 Understand the Principles of IPv6 Addressing, IPv6 and ICMPv6 Protocols.

PART- A

Unit 1: Introduction to Neural Network

- 1.1 The OSI Model and the TCP/IP Protocol Suite
- 1.2 Protocol Layers, The OSI Model, TCP/IP Protocol suite and addressing.
- 1.3 IPV4 Addresses- Introduction, Classful and Classless Addressing
- 1.4 Internet Protocol Version4(IPv4) – Datagrams, Fragmentation, Options, Checksum, Security, IP Package.

Unit 2: Learning Networks

- 2.1 Introduction to the Transport Layer – Transport Layer Services and Protocols.
- 2.2 User Datagram Protocol (UDP) – Introduction, User Datagram, UDP Services and Applications, UDP Package.

Unit 3: Concepts of Deep Learning

- 3.1 Transmission Control Protocol – I: TCP Services, Features
- 3.2 Segment
- 3.3 TCP Connection
- 3.4 Windows in TCP.

PART-B

Unit 4 Parameters in Deep Learning

- 4.1 Transmission Control Protocol – II: Flow Control
- 4.2 Error Control, Congestion Control,
- 4.3 TCP Timers, Options and TCP Package.

Unit 5: Algorithms

- 5.1 IPv6 Addressing – Introduction, Address Space Allocation
- 5.2 Global Unicast Addresses, Autoconfiguration and Renumbering.
- 5.3 IPv6 Protocol - Introduction, Packet Format, Transition from IPv4 to IPv6.
- 5.4 ICMPv6 - Introduction, Error Messages, Informational Messages
- 5.5 Neighbor Discovery Messages, Group Membership Messages.

Unit 6: Modelling techniques in Neural Networks

- 6.1 Internet Protocol: IPv4 - IP Datagram Formats
- 6.2 Data and Fragmentation - Address Masks
- 6.3 Prefixes- and Subnetworks - Network Address Translation (NAT)

Suggested Readings:

1. TCP/IP Protocol Suite, Behrouz A. Forouzan, 4th Edition, Tata McGraw-Hill Edition

Note: Only latest editions of the books are recommended.

Software required/ Web links:

1. http://wwwdb.deis.unibo.it/courses/TW/DOCS/w3schools/website/web_tcpip.asp.html#gsc.tab=0
2. <https://www.ibm.com/docs/en/cics-ts/5.3?topic=web-internet-tcpip-http-concepts>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). A student is required to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
 Sessional tests
 Surprise questions during lectures/Class Performance
 Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-CN-004.1	2	1		2			2						3	3
MCA-CN-004.2	1	3	1	1			2						2	2
MCA-CN-004.3	1	2	1	1			2						2	3
MCA-CN-004.4	1	2	2	3	2		1						3	2
MCA-CN-004.5	2	1	1	3	2		2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-AR-003: 3-D MODELS FOR AUGUMENTED & VIRTUAL REALITY

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks : 100

Continuous Evaluation: 50

End Semester Examination: 50

Co-Requisite: Computer networks

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-AR-003.1. Understand and apply the concepts of 3D modeling and VR, they will be in a position to distinguish concepts such as virtual, mixed, and augmented reality

MCA-AR-003.2. Explain and implement workflows to created 3D content from existing and historic and future environments

MCA-AR-003.3. Use a variety of software solutions for 3D model creation such as SketchUp, CityEngine (theoretical), Unity

MCA-AR-003.4. Understand the emerging possibilities of environmentally sensed information

MCA-AR-003.5. Create 3D models and make them accessible in an interactive way through the use of game engines.

PART-A

UNIT 1: Introduction and Overview of 3D Modeling and Virtual Reality

- 1.1 Distinguishing VR, AR, and MR Systems
- 1.2 3D Modeling and VR in the Geospatial Sciences
- 1.3 Applications of 3D Modeling
- 1.4 An overview of Workflows for 3D Model construction
- 1.5 Static 3D Modeling, Data-Driven Modeling & Procedural Modelling
- 1.6 3D and VR Application Building Workflows

UNIT 2: Hands-on Modeling using SketchUp

- 2.1 Installing SketchUp
- 2.2 Optimization and Rendering
- 2.3 Create a building
- 2.4 SketchUp and Sketchfab

UNIT 3: Introduction to Procedural Modeling & ArcGIS Pro

- 3.1 Overview of procedural modelling
- 3.2 Introduction to CityEngine and its CGA shape Grammar
- 3.3 Create a road map of University park campus
- 3.4 Symbolizes Layers and Edit features
- 3.5 Explore Raster and 3D data

PART-B

UNIT 4: 3D Spatial Analysis

- 4.1 Overview of 3D spatial Analysis
- 4.2 Flood Analysis
- 4.3 Sun Shadow Volume Analysis
- 4.4 Reflection in Spatial Modeling in 3D

UNIT 5: UNITY I

- 5.1 Overview of UNITY 1

- 5.2 The Unity3D Game Engine
- 5.3 Unity interface and Basic Unity Concepts
- 5.4 Walkthrough: Using Unity to Build a Stand-Alone Windows application
- 5.5 First Game in Unity: Roll-the-Ball

UNIT 6: Unity II

- 6.1 3D Applications in Unity
- 6.2 Walkthrough: From SketchUp Model to Unity
- 6.3 Animations and state change in Unity
- 6.4 Walkthrough: Creating a camera Animation
- 6.5 Unity Based VR Applications for mobile devices
- 6.6 Walkthrough: Creating a 360 degree Movie for Google Cardboard

Suggested Readings:

1. Kelly S. Hale (Editor), Kay M. Stanney, 2014, Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition (Human Factors and Ergonomics).
2. Michael Madary and Thomas K. Metzinger, 2016, Real Virtuality: A Code of Ethical Conduct. Recommendations for Good Scientific Practice and the Consumers of VR-Technology. Frontiers in Robotics and AI
3. Jason Jerald, 2015, The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool Publishers.
4. Tony Parisi, 2015, Learning Virtual Reality, O,Reilly.

Note: Only latest editions of the books are recommended

Web Links:

1. Find and Use 3-D Models and Resources for Augmented Reality : Learning Solutions | The Learning Guild
2. Getting started with 3D graphics for augmented reality - YouTube

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
- Sessional tests
- Surprise questions during lectures/Class Performance
- Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AR-003.1	1	1	2	2	3		3	2					3	3
MCA-AR-003.2	1	1	1	1	1		2	2			3		3	3
MCA-AR-003.3	1	1		1	2		2	2			3		2	3
MCA-AR-003.4	1		1	1	1		2	1			3		2	2
MCA-AR-003.5	1	1	1	1			2	2					1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-AR-004: VR AND 360 VIDEO PRODUCTION

Periods/week Credits
L: 2 T: 0 2

Max. Marks: 200
Continuous Evaluation: 100

Duration of Examination: 3 Hrs

End Semester Examination: 100

Pre-Requisite: Knowledge of Multimedia

Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:

MCA-AR-004.1 Describe how VR systems work and list the applications of VR.

MCA-AR-004.2 Understand the design and implementation of the hardware that enables VR systems to be built.

MCA-AR-004.3 Understand the system of human vision and its implication on perception and rendering.

MCA-AR-004.4 Explain the concepts of motion and tracking in VR systems.

MCA-AR-004.5 Describe the importance of interaction and audio in VR systems.

PART-A

UNIT 1: Introduction to Virtual Reality

- 1.1 Defining Virtual Reality, History of VR,
- 1.2 Human Physiology and Perception,
- 1.3 Key Elements of Virtual Reality Experience,
- 1.4 Virtual Reality System, Interface to the Virtual World-
- 1.5 Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

Unit 2: The Geometry of Virtual Worlds & The Physiology of Human Vision

- 2.1 Geometric Models,
- 2.2 Changing Position and Orientation,
- 2.3 Axis-Angle Representations of Rotation,
- 2.4 Viewing Transformations,
- 2.5 Chaining the Transformations,
- 2.6 Human Eye, eye movements & implications for VR.

Unit 3: Visual Perception & Rendering

- 3.1 Visual Perception –
- 3.2 Perception of Depth, Perception of Motion,
- 3.3 Perception of Color, Combining Sources of Information
- 3.4 Visual Rendering -Ray Tracing and Shading Models,
- 3.5 Rasterization, Correcting Optical Distortions,
- 3.6 Improving Latency and Frame Rates

PART-B

Unit 4: Motion & Tracking

- 4.1 Motion in Real and Virtual Worlds-
- 4.2 Velocities and Accelerations, The Vestibular System,
- 4.3 Physics in the Virtual World, Mismatched Motion and Vection Tracking-
- 4.4 Tracking 2D & 3D Orientation,
- 4.5 Tracking Position and Orientation, Tracking Attached Bodies

UNIT 5: Interaction & Audio

- 5.1 Interaction - Motor Programs and Remapping,
- 5.2 Locomotion, Manipulation, Social Interaction. Audio –
- 5.3 The Physics of Sound,
- 5.4 The Physiology of Human Hearing,
- 5.5 Auditory Perception, Auditory Rendering.

Unit 6: 360 Video

- 6.1 What is 360 Video?,
- 6.2 3-DoF vs 6-DoF, Position and Orientation,
- 6.3 Agency, Presence, and Immersion,
- 6.4 Point of View (POV),
- 6.5 Mono vs. Stereo, Parallax, Equirectangular Projection & Cubemaps,
- 6.6 Field of View (FOV), Stitch Lines

Suggested Readings:

1. Steven M. LaValle, 2016, Virtual Reality, Cambridge University Press.
2. William R Sherman and Alan B Craig, 2002, Understanding Virtual Reality: Interface, Application and Design, Morgan Kaufmann Publishers.
3. Alan B Craig, William R Sherman and Jeffrey D Will 2009, Developing Virtual Reality Applications: Foundations of Effective Design, , Morgan Kaufmann.
4. Gerard Jounghyun Kim, 2005, "Designing Virtual Systems: The Structured Approach, Springer.
5. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, 2005, "3D User Interfaces, Theory and Practice", Addison Wesley
6. Oliver Bimber and Ramesh Raskar, 2005, "Spatial Augmented Reality: Merging Real and Virtual Worlds, Routledge.
7. Burdea, Grigore C and Philippe Coiffet, 2003, "Virtual Reality Technology", Wiley Interscience.

Note: Only latest editions of the books are recommended.

Web links:

<http://lavalle.pl/vr/book.html>

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%
Assignment	20%
Class performance	10%
Attendance	10%

Assessment Tools:

- Assignment/Tutorials
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COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-AR-004.1	3	1	2	2	3		2						3	1
MCA-AR-004.2	1	1	2	3	1		2						3	1
MCA-AR-004.3	2	2	2	1	1								2	1
MCA-AR-004.4	1	1	2	1	1		3						1	2
MCA-AR-004.5	2	2	2	1			2	3					2	2

Appendix-A

List of courses having relevance to the Local/Regional, National and Global Development needs.

Course Code	Course Name	Regional	National	Global
MCA-RIC-I	Research Innovation Catalyst-I			√
MCA-DS-110	Linear Algebra and Statistical Techniques			√
MCA-DS-111	Data Structures		√	
MCA-DS-112	Object Oriented Programming in Java			√
MCA-DS-161	Data Structures Lab			√
MCA-DS-162	Object Oriented Programming in Java Lab			√
MCA-DS-163	Python Programming Lab			√
MCA-DS-113	Python Programming			√
CDC 511	Placement Competency Enhancement -I			√
MCA-DS-115	MATLAB			√
MCA-DS-116	Soft Programming			√
MCA-CC-001	Azure Fundamentals			√
MCA-CC-002	Fundamentals of Cloud Computing			
MCA-AI-001	Concepts of AI & Machine Learning			√
MCA-AI-002	Probabilistic Reasoning			√
MCA-CS-001	Network Security			√
MCA-FSD-001	Gaming Technology-I			√
MCA-FSD-002	Advanced Web Technologies			√
MCA-MC-001	Mobile Computing basics			
MCA-MC-002	Mobile Software Technologies			√
MCA-MM-001	Digital methods I: Photoshop, Illustrator		√	
MCA-MC-002	Animation Fundamentals			√
MCA-DS-117	Basics of E-Commerce			
MCA-DS-118	Introduction to Open Source Software and Open Standards			√
MCA-IOT-001	IoT Basics and Technology			√
MCA-IOT-002	Hardware Architectures			√
MCA-DAS-001	Probability and Statistics			√
MCA-DAS-002	Introduction to Data Science			√
MCA-BC-001	Introduction to block chain			√
MCA-BC-002	Block chain implementation and applications			√
MCA-DO-001	DevOps Essentials			√
MCA-DO-002	AWS Services			√
MCA-CN-001	Fundamentals of Computer Networks			√

MCA-CN-002	Routing Protocols and Architectures			√
MCA-AR-001	Augmented Reality Foundations			√
MCA-AR-002	Animation and Rendering Techniques		√	
MCA-RIC-II	Research Innovation Catalyst-II			√
MCA-DS-210	Data Communications		√	
MCA-DS-211	Analysis & Design of Algorithm		√	
MCA-DS-212	Int to Artificial Intelligence			√
MCA-DS-264	Android Application Development Lab			√
MCA-DS-263	R Programming Lab			√
MCA-DS-213	Vocational Training		√	
CDC 512	Placement Competency Enhancement-II			√
MCA-DS-214	Computer Graphics		√	
MCA-DS-215	Web Applications Development using PHP			√
MCA-CC-003	Cloud Computing platforms			√
MCA-CC-004	Programming wth AWS			√
MCA-AI-003	Supervised Learning			√
MCA-AI-004	Text Mining			√
MCA-CS-003	Cryptographic			√
MCA-CS-004	Ethical Hacking			√
MCA-FSD-003	Gaming Technology -II			√
MCA-FSD-004	Angular			√
MCA-MC-003	Autmotive Computing			√
MCA-MC-004	Mobile games		√	
MCA-MM-003	Compositing and Visual Effect			√
MCA-MM-004	Modelling & Texturing			√
MCA-DS-217	Social Network Analytics			√
MCA-IOT-003	Communication technologies in IoT			√
MCA-IOT-004	Software & Programming in IoT			√
MCA-DAS-003	Data Analytics & Visualization using Excel			√
MCA-DAS-004	Data Analytics & Visualization using Python		√	
MCA-BC-003	Blockchain architecture			√
MCA-BC-004	Blockchain and smart contracts			√
MCA-DO-003	DevOps Software Engineering			√
MCA-DO-004	Continouos integration & Version Control			√
MCA-CN-003	Network Protocols		√	
MCA-CN-004	TCP/IP			√
MCA-AR-003	3D Models for Augmented and Virtual Reality			√
MCA-AR-004	VR and 360 Video Production			√

MCA-DS-216	Advance Database Systems		√	
MCA-RIC-III	Research Innovation Catalyst-III			√
MCA-DS-311	Software Engineering & Testing			√
MCA-DS-312	Operations Research			√
MCA-DS-314	Big Data Analytics			√
MCA-DS-310	Data Mining & warehousing			
MCA-DS-364	Big Data Analytics lab			√
MCA-DS-360	Data Mining Lab		√	
MCA-DS-316	Automata Theory		√	
MCA-DS-317	Compiler Design		√	
MCA-CC-005	Cloud Data Storage & Management			√
MCA-CC-006	Programming with GAE			√
MCA-AI-005	Unsupervised Learning			√
MCA-AI-006	IoT with machine Learning			√
MCA-CS-005	Cyber Forensics		√	
MCA-CS-006	Web Application Security			√
MCA-FSD-005	Agile, Design thinking and DevOps			√
MCA-FSD-006	Automated Testing Using Selenium			√
MCA-MC-005	Smart Energy			√
MCA-MC-006	Logistics			√
MCA-MM-005	Acting and Choreography			√
MCA-MM-006	Digital Character Animation			√
MCA-DS-318	Multimedia Basics			√
MCA-IOT-005	Sensors, Actuators and Signal Processing			√
MCA-IOT-006	Data Management in IoT			√
MCA-DAS-005	SQL for Data Science			√
MCA-DAS-006	Time series Analytics-I			√
MCA-BC-005	Applications of Blockchain-Cryptocurrencies			√
MCA-BC-006	Smart Contract Application & Development			√
MCA-DO-005	Containerization with Docker			√
MCA-DO-006	DevOps Process Simulation			√
MCA-CN-005	Advanced Computer Network			√
MCA-CN-006	Network Management			√
MCA-AR-005	Game Design Fundamentals			√
MCA-AR-006	Immersive Technology and Media			√
MCA-DS-319	Software Project Management		√	
MCA-DS-410	Introduction to .NET			
MCA-DS-411	Advance Java			√
MCA-DS-461	Advance Java Lab			√

MCA-DS-462	Project		√	√
MCA-DS-463	Major Project		√	√
MCA-DS-412	Digital Image Processing			√
MCA-DS-413	Software API processes			√
MCA-CC-007	Cloud Security Management			√
MCA-CC-008	Ethics and standard of cloud.			√
MCA-AI-007	Neural Networks and Machine Learning			√
MCA-AI-008	Machine Learning and Pattern Recognition			√
MCA-CS-007	Cyber Laws			√
MCA-CS-008	Information Security and Research			√
MCA-FSD-007	React JS			√
MCA-FSD-008	Cloud Security			√
MCA-MC-007	Ambient Assisted Living/Mobile Health			√
MCA-MC-008	Mobile Infotainment			√
MCA-MM-007	Multimedia in Media Production			√
MCA-MM-008	Multimedia Security		√	
MCA-DS-414	Decision Support System			√
MCA-DS-415	Simulation Modelling			√
MCA-IOT-007	IoT Security Management			√
MCA-IOT-008	IoT Applications			√
MCA-DAS-007	Statistical methods in Decision making			√
MCA-DAS-008	Time Series Analytics-II			√
MCA-BC-007	Spring framework			√
MCA-BC-008	Introduction to cryptography			√
MCA-DO-007	Web Application on Cloud			√
MCA-DO-008	DevOps Project Management			√
MCA-CN-007	Next Generation Networking			√
MCA-CN-008	Wireless Networking		√	
MCA-AR-007	Virtual Reality: Interface, Application and Design			√
MCA-AR-008	Interactive Application Development.			√
MCA-DS-410	Introduction to .NET		√	
MCA-DS-460	Introduction to .NET Lab		√	

Appendix B: List of courses having focus on Employability, Entrepreneurship and Skill Development

Course Code	Course Name	Employability	Entrepreneurship	Skill development
MCA-DS-161	Data Structures Lab	√		√
MCA-DS-162	Object oriented programming in Java Lab	√		√
MCA-DS-163	Python Programming Lab	√		√
MCA-DS-264	Android Application Development Lab	√		√
MCA-DS-263	R Programming Lab	√		√
CDC 511	Placement Competency Enhancement-I	√		
CDC 512	Placement Competency Enhancement-II	√		
MCA-DS-460	. NET Lab	√		√
MCA-DS-364	Big Data Analytics Lab	√		√
MCA-DS-360	Data Mining Lab	√		√
MCA-DS-461	Advance Java Lab	√		√
MCA-DS-462	Major Project	√	√	√
MCA-DS-463	Project	√	√	√

Appendix C: List of courses and proposed activities relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability

	Environment and Sustainability	Professional Ethics	Human Values	Gender Equality
Activity on Gender Sensitization				√
Workshop on Ethical Hacking		√		

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