



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

**Centre for Distance and Online Education
CURRICULUM
AND**

SCHEME OF EXAMINATION

**MASTER OF COMPUTER APPLICATIONS
(ONLINE DEGREE PROGRAMME) AS PER NEP 2020**

BATCH: 2024- 26 AND ONWARDS

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 Studie

(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.

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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Centre for Distance and Online Education

VISION

Through online education, Manav Rachna stands tall to bring the most efficacious environment for providing higher quality academic and research oriented education to the aspirants. Manav Rachna Online Education facilitate the goal of increasing access to enduring learning prospects to students and providing opportunities to make efficient use of scarce resources in light of the new economic realities of higher education.

MISSION

To provide an exclusive learning environment to students with flexible and meticulous online learning opportunities that will guide students to acquire the knowledge and skills as per the requirements of society at large. The aim of Manav Rachna Online Education is:

- To develop emerging skills through online learning methodologies to pursue their Academic and Professional goals.
- To impart profound knowledge and understanding of conceptual aspects of multidisciplinary learning.

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, industryready 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 32 credits.

MCA STUDY SCHEME (FOR 2024-26 Batch)

Semester-I

Course Type	Course Name	Course Code	Internal marks	External marks	Total	Credits
Core	Research Innovation Catalyst-I	O6.0CA100C05	100	-	100	0.5
Core	Linear Algebra & Statistical Techniques	O6.0CA100C01	30	70	100	3
Core	Data Structures	O6.0CA101C01	30	70	100	3
Core	Object oriented programming in Java	O6.0CA102C01	30	70	100	3
Core	Python Programming	O6.0CA103C01	30	70	100	3
Core	Data Structures Lab	O6.0CA151C01	30	70	100	1
Core	Object oriented programming in Java Lab	O6.0CA152C01	30	70	100	1
Core	Python Programming Lab	O6.0CA153C01	30	70	100	1
Domain Elective	Elective-I		30	70	100	2
Domain Elective	Elective-II		30	70	100	2
Core	Placement Competency Enhancement -I	O6.0CDC196C05	30	70	100	1
Bridge	Fundamentals of Computer Programming	O6.0CA100C09	30	70	100	Audit Pass
Bridge	Elements of Mathematics	O6.0CA101C09	30	70	100	Audit Pass
Total Credits						20.5

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
ELECTIVE-I	MATLAB (O6.0CA100E02)	Azure Fundamentals (O6.0CA102E02)	Concepts of AI & Machine Learning. (O6.0CA104E02)	Network Security (O6.0CA106E02)	Gaming Technology – I (O6.0CA108E02)	Mobile Computing Basics (O6.0CA110E02)	Digital methods I: Photoshop, Illustrator (O6.0CA112E02)
	Soft Programming (O6.0CA101E02)	<i>Fundamentals of Cloud Computing (O6.0CA103E02)</i>	Probabilistic Reasoning (O6.0CA105E02)	Cyber Security (O6.0CA107E02)	Advanced Web Technologies. (O6.0CA109E02)	Mobile Software Technologies. (O6.0CA111E02)	Animation Fundamentals (O6.0CA113E02)
		IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
ELECTIVE-II	<i>Basics of E-Commerce (O6.0CA114E02)</i>	IoT Basics and Technology (O6.0CA116E02)	Probability and Statistics (O6.0CA118E02)	Introduction to block chain (O6.0CA120E02)	DevOps Essentials (O6.0CA122E02)	Fundamentals of Computer Networks (O6.0CA124E02)	Augmented Reality Foundations (O6.0CA126E02)

	Introduction to Open Source Software and Open Standards (O6.0CA115E02)	Hardware Architectures (O6.0CA117E02)	Introduction to Data Science (O6.0CA119E02)	Block chain implementation and applications (O6.0CA121E02)	AWS Services (O6.0CA123E02)	Routing Protocols and Architectures (O6.0CA125E02)	Animation and Rendering Techniques (O6.0CA127E02)
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Semester-II

Course Type	Course Name	Course Code	Int mark	Ext marks	Total	Credits
Core	Data Communications	O6.0CA220C01	30	70	100	3
Core	Analysis & Design of Algorithm	O6.0CA221C01	30	70	100	3
Core	Introduction to Artificial Intelligence	O6.0CA222C01	30	70	100	3
Core	Vocational Training	O6.0CA200C06	100	-	100	2
Core	R Programming Lab	O6.0CA276C01	30	70	100	1
Core	Android Application Development Lab	O6.0CA277C01	30	70	100	1
SEC	Research Innovation Catalyst-II	O6.0CA219C05	100	-	100	0.5
SEC	Placement Competency Enhancement-II	O6.0CDC296C05	30	70	100	1
Domain Elective	Elective-III		30	70	100	2
Domain Elective	Elective-IV		30	70	100	2
Total Credits						18.5

	General	Cloud Computing	Artificial Intelligence	Cyber Security	Full Stack Development	Mobile Computing	Multimedia
Elective-III	Computer Graphics (O6.0CA200E02)	Cloud Computing Platforms (O6.0CA202E02)	Supervised Learning (O6.0CA204E02)	Cryptographic (O6.0CA206E02)	Gaming Technology -II (O6.0CA208E02)	Automotive Computing (O6.0CA210E02)	Compositing and Visual Effect (O6.0CA212E02)
	Web Applications Development using PHP (O6.0CA201E02)	Programming with AWS (O6.0CA203E02)	Text Mining (O6.0CA205E02)	Ethical Hacking. (O6.0CA207E02)	Angular (O6.0CA209E02)	Mobile games (O6.0CA211E02)	Modelling & Texturing (O6.0CA213E02)
	General	IoT	Data Science	Blockchain	DevOps	Networking	Gaming with AR VR
Elective-	Advance Database Systems (O6.0CA214E02)	Communication technologies in IoT (O6.0CA216E02)	Data Analytics & Visualization using Excel (O6.0CA218E02)	Blockchain architecture (O6.0CA220E02)	DevOps Software Engineering (O6.0CA222E02)	Network Protocols (O6.0CA224E02)	3D Models for Augmented and Virtual Reality (O6.0CA226E02)

IV	Social Network Analytics (O6.0CA215E02)	Software & Programming in IoT (O6.0CA217E02)	Data Analytics & Visualization using Python (O6.0CA219E02)	Blockchain and smart contracts (O6.0CA221E02)	Continuous integration & Version Control (O6.0CA223E02)	TCP/IP (O6.0CA225E02)	VR and 360 Video Production (O6.0CA227E02)
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Semester-III

Course Type	Course Name	Course Code	Int marks	Ext marks	Total	Credits
Core	Data Mining and warehousing	O6.5CA100C01	100	100	200	3
Core	Software Engineering & Testing	O6.5CA101C01	100	100	200	3
Core	Operations Research	O6.5CA102C01	100	100	200	3
Core	Big Data Analytics	O6.5CA103C01	100	100	200	3
Core	Data Mining Lab	O6.5CA151C01	30	70	100	1
Core	Big Data Analytics Lab	O6.5CA152C01	30	70	100	1
Domain Elective	Elective-V		100	100	200	2
Domain Elective	Elective-VI		100	100	200	2
SEC	Research Innovation Catalyst-III	O6.5CA100C05	100		100	1
Total Credits						19

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
Elective-V	Automata Theory (O6.5CA100E02)	Cloud Data Storage & Management (O6.5CA102E02)	Unsupervised Learning (O6.5CA104E02)	Cyber Forensics (O6.5CA106E02)	Agile Methodologies and DevOps (O6.5CA108E02)	Smart Energy (O6.5CA110E02)	Multimedia in Acting and Choreography (O6.5CA112E02)
	Compiler Design (O6.5CA101E02)	Programming with GAE (O6.5CA103E02)	IoT with machine Learning (O6.5CA105E02)	Web Application Security (O6.5CA107E02)	Automated Testing Using Selenium. (O6.5CA109E02)	Logistics (O6.5CA111E02)	Digital Character Animation (O6.5CA113E02)
	General	IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
Elective-VI	Multimedia and its tools (O6.5CA114E02)	Sensors, Actuators and Signal Processing (O6.5CA116E02)	SQL for Data Science (O6.5CA118E02)	Applications of Blockchain (O6.5CA120E02)	Containerization with Docker (O6.5CA122E02)	Advanced Computer Network (O6.5CA124E02)	Game Design Fundamentals (O6.5CA126E02)
	Software Project Management (O6.5CA115E02)	Data Management in IoT (O6.5CA117E02)	Time series Analytics-I (O6.5CA119E02)	Smart Contract Application & Development (O6.5CA121E02)	Advanced DevOps Tools (O6.5CA123E02)	Network Management (O6.5CA125E02)	Immersive Technology and Media (AR/VR) (O6.5CA127E02)

Semester-IV

Course Type	Course Name	Course Code	Total	Int marks	Ext marks	Total	Credits
Core	Introduction to .NET	O6.5CA200C01	3	100	100	200	3
Core	Advanced Java	O6.5CA201C01	3	100	100	200	3
Core	Introduction to .NET Lab	O6.5CA251C01	4	50	50	100	2
Core	Advanced Java Lab	O6.5CA252C01	2	50	50	100	1
Core	Project	O6.5CA200C07		100	-	100	5
Domain Elective	Elective-VII		2	100	100	200	2
Domain Elective	Elective-VIII		2	100	100	200	2
OR							
Core	Major Project	O6.5CA201C07	100	-	100	-	18
Total Credits							18

	General	Cloud Computing	Artificial Intelligence	Cyber Security	FSD	Mobile Computing	Multimedia
Elective-VII	Digital Image Processing (O6.5CA200E02)	Cloud Security Management (O6.5CA202E02)	Neural Networks and Deep Learning (O6.5CA204E02)	Cyber Laws (O6.5CA206E02)	React JS (O6.5CA208E02)	Ambient Assisted Living/Mobile Health (O6.5CA210E02)	Multimedia in Media Production (O6.5CA212E02)
	Software API processes (O6.5CA201E02)	Ethics and standard of cloud. (O6.5CA203E02)	Machine Learning and Pattern Recognition (O6.5CA205E02)	Information Security (O6.5CA207E02)	Cloud Security (O6.5CA209E02)	Mobile Infotainment (O6.5CA211E02)	Multimedia Security (O6.5CA213E02)
		IoT	Data Science	Block Chain	DevOps	Networking	Gaming with AR VR
Elective-VIII	Intelligent Decision Support System (O6.5CA214E02)	IoT Security Management (O6.5CA216E02)	Statistical methods in Decision making (O6.5CA218E02)	Spring framework (O6.5CA220E02)	Web Application on Cloud (O6.5CA222E02)	Next Generation Networking. (O6.5CA224E02)	Virtual Reality: Interface, Application and Design (O6.5CA226E02)
	Simulation Modelling (O6.5CA215E02)	IoT Applications (O6.5CA217E02)	Time series Analytics-II (O6.5CA219E02)	Cryptography Algorithms (O6.5CA221E02)	DevOps Project Management (O6.5CA223E02)	Wireless Networking (O6.5CA225E02)	Interactive Application Development. (O6.5CA227E02)

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

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6.0CA100C05: RESEARCH INNOVATION CATALYST-I

Periods/week Credits
T: 1 0.5

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

Pre-requisites: Basic knowledge of Research and Innovation

Course Type: SEC

Course Outcomes:

- 6.0CA100C05.1. The students will be able to understand what is Research and Innovation.
- 6.0CA100C05.2. To be in a position to describe the process and the procedure to carry out research/ innovation
- 6.0CA100C05.3. To understand the research documentation that is needed for, journals publication, conferences etc.
- 6.0CA100C05.4. To understand and adopt the ethical practice in the research / Innovation activities.
- 6.0CA100C05.5. To comprehend the benefits obtained by means of systematic research/ Innovation
- 6.0CA100C05.6. 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	<input type="checkbox"/> Percentage of classes attended by the students	3+2	5
Group participation and response of the students to a given task	<input type="checkbox"/> Judge individual student in the group <input type="checkbox"/> Meeting timelines as per lesson plan	5 10	15
Selection of research/ Innovation topics and Literature Survey	<input type="checkbox"/> Student interaction with faculty mentors <input type="checkbox"/> Relevance of the topic <input type="checkbox"/> Usage of Scientific Literature Databases. e.g., Scopus/ Web of Science/ etc. <input type="checkbox"/> Scientific/Technical writing <input type="checkbox"/> Number of relevant papers referred for the given topic	3 2 1 2 2	10
Presentation and Report Making	<input type="checkbox"/> Report structure and Slide sequence, <input type="checkbox"/> Contribution of individual group member towards the presentation and report <input type="checkbox"/> Reference listing <input type="checkbox"/> Plagiarism/Authenticity of the report	5 5 5 5	20

Course Articulation Matrix:

CO Statement (XX-300)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
6.0CA100C05.1	√	√	√	√	√	√			√		√		√	√
6.0CA100C05.2			√	√	√				√				√	√
6.0CA100C05.3		√		√					√	√			√	√
6.0CA100C05.4								√					√	√
6.0CA100C05.5	√					√	√					√	√	√
6.0CA100C05.6	√	√							√			√	√	√

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA100C01: LINEAR ALGEBRA AND STATISTICAL TECHNIQUES

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of basic mathematics

Course Type: Fundamentals

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

- O6.0CA100C01.1. Learn the concepts and methods of Linear Algebra.
- O6.0CA100C01.2. Interpret the ability to solve problems using Linear Algebra.
- O6.0CA100C01.3. Relate Linear Algebra to other domains of study.
- O6.0CA100C01.4. Examine the impact of Skewness and outliers on the various statistical interpretations.
- O6.0CA100C01.5. 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 multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (i) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (ii) For Summative assessment (End Semester Examination or End-Term Examination):
 Minimum: 70 percent. Categorization for the same is:
 Objective Type Questions: 30%
 Short/Long Questions: 70%

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
O6.0CA100C01.1	1		1	2	2		3						3	1
O6.0CA100C01.2	1	1	2	3	1		2						3	1
O6.0CA100C01.3	1	2	2	1	2								2	1
O6.0CA100C01.4	1	1	2	1	1		3						1	2
O6.0CA100C01.5	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)

06.0CA101C01: DATA STRUCTURES

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Basic concepts of C Programming

Course Type: Core

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

- O6.0CA101C01.1. Describe the concept to evaluate asymptotic performance of algorithms.
- O6.0CA101C01.2. Develop skills to design and analyze simple linear and non-linear data structures.
- O6.0CA101C01.3. Apply for solving problem like traversing, searching, sorting, insertion and deletion of data.
- O6.0CA101C01.4. Demonstrate linear and non-linear data structures in real life problems.
- O6.0CA101C01.5 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 (Last visited Date: 21 February, 2024)

<http://toolsqa.com/data-structures-tutorial/> (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (iii) Continuous or formative assessments (in the form of end semester examination or term examination). Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (iv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions: 30%

Short/Long Questions: 70%

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
O6.0CA101C01.1	1	1	2	2	3		3	2					3	3
O6.0CA101C01.2	1	1	1	1	1		2	2			3		3	3
O6.0CA101C01.3	1	1	1	1	2		2	2			3		2	3
O6.0CA101C01.4	1	1	1	1	1		2	1			3		2	2
O6.0CA101C01.5	1	1	1	1			2	2					1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.OCA102C01: OBJECT ORIENTED PROGRAMMING IN JAVA

Periods/week

Credits

Max. Marks: 100

L: 3

3

Continuous Evaluation: 30

Duration of Examination: 3 Hrs

End Semester Examination: 70

Pre-Requisite: Knowledge of C++ Programming

Course Type: Core

O6.OCA102C01.1. Understand the Object-oriented concepts of modern programming language.

O6.OCA102C01.2. Identify classes, objects, functions and relationships among them needed for a specific problem.

O6.OCA102C01.3. Use Java in a variety of technologies and on different platforms.

O6.OCA102C01.4. Demonstrate the concepts of Polymorphism and Inheritance.

O6.OCA102C01.5. Design solutions of basic problems using Object-oriented approach.

O6.OCA102C01.6. 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> (Last visited Date: 21 February, 2024)

<https://www.javatpoint.com/java-tutorial> (Last visited Date: 21 February, 2024)

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Evaluation Policy:

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- (v) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%

- Projects/Group Activities etc 15%
- (vi) For Summative assessment (End Semester Examination or End-Term Examination):
 Minimum: 70 percent. Categorization for the same is:
 Objective Type Questions: 30%
 Short/Long Questions: 70%

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
O6.0CA102C01.1	2	2		3	1								2	3
O6.0CA102C01.2	2	1		3	2									3
O6.0CA102C01.3	2	2	1	3				1						3
O6.0CA102C01.4	3	3	1	2				1					2	2
O6.0CA102C01.5	2	2	1	2				1			3			3
O6.0CA102C01.6	3	2	1	2			1							3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.OCA103C01: PYTHON PROGRAMMING

Periods/week Credits

L: 2 3

Max. Marks: 100

Continuous Evaluation: 30

Duration of Examination: 3 Hrs

End Semester Examination: 70

Pre-Requisite: Knowledge of Programming Languages

Course Type: Core

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

- O6.OCA103C01.1. Define the methodology and procedures related to python programming
- O6.OCA103C01 2. Demonstrate the concepts of control structures in Python.
- O6.OCA103C01.3. Use Python data structures to solve complex problems.
- O6.OCA103C01.4. Illustrate the use of various python libraries and functions.
- O6.OCA103C01.5. 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 RBG 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> (Last visited Date: 21 February, 2024)

<https://www.programiz.com/python-programming/first-program> (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
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Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA103C01.1	3	2	1			2							2	2
O6.0CA103C01.2		1		1			1	1	1	2			1	1
O6.0CA103C01.3		3							1				1	3
O6.0CA103C01.4		3						1					1	3
O6.0CA103C01.5		3	3	2	2	1	1	1		1			2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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06.0CA151C01: DATA STRUCTURES LAB

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Co-Requisite: Knowledge of basic C Programming
Course Type: Core

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

- 06.0CA151C01.1 Analyze the asymptotic performance of various algorithms
- 06.0CA151C01.2 Design and implement various algorithms with use of arrays, records, linked structures, stacks, queues, trees, and graphs
- 06.0CA151C01.3 Demonstrate different methods for traversing trees.
- 06.0CA151C01.4 Compare alternative implementations of data structures with respect to performance.
- 06.0CA151C01.5 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 (Last visited Date: 21 February, 2024)

<https://www.includehelp.com/data-structure-tutorial> (Last visited Date: 21 February, 2024)

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
O6.0CA151C01.1	1	1	1		2		2						2	3
O6.0CA151C01.2	1	1	1				2						3	3
O6.0CA151C01.3	1	1	2	2	1		1	2					1	2
O6.0CA151C01.4	1	1	2	2	1		2	2				3	2	2
O6.0CA151C01.5	1	1	1	1	2		2	3				3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.0CA152C01: OBJECT ORIENTED PROGRAMMING IN JAVA LAB

Periods/week	Credits	Max. Marks	: 100
P: 2 T: 0	1	Continuous Evaluation	: 30
Duration of Examination: 3 Hrs		End Semester Examination	: 70

Co-Requisite: Knowledge of Java Programming

Course Type: Core

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

- 06.0CA152C01.1. Solve basic problems using concepts of object-oriented programming.
- 06.0CA152C01.2. Implement solutions to complex problems using Control Structures, string manipulation and functions.
- 06.0CA152C01.3. Propose the use of techniques (inheritance, polymorphism) by implementing them in the Java programming language to solve the given problem
- 06.0CA152C01.4. 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> (Last visited Date: 21 February, 2024)

<https://www.javatpoint.com/java-tutorial> (Last visited Date: 21 February, 2024)

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
O6.0CA152C01.1	3				1	1	2						1	2
O6.0CA152C01.2		2	2		2	2	2				2		3	3
O6.0CA152C01.3	2	2		1		1	1	1	1		2		2	3
O6.0CA152C01.4	2	2				1	1	1	1		1	1	3	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA153C01 : PYTHON PROGRAMMING LAB

Periods/week	Credits	Max. Marks : 100
P: 2	1	Continuous Evaluation : 30
Duration of Examination: 2 Hrs		End Semester Examination: 70

Co-Requisite: Knowledge of Programming concepts

Course Type: Core

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

O6.0CA153C01.1. Develop programs using basics of Python.

O6.0CA153C01.2. Use Python data structures to solve complex problems.

O6.0CA153C01.3. Demonstrate the concepts of control structures in Python.

O6.0CA153C01.4. Apply the concepts of file handling and regular expression using packages.

O6.0CA153C01.5. 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:
- 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.
 - 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> (Last visited Date: 21 February, 2024)

<https://www.programiz.com/python-programming/first-program> (Last visited Date: 21 February, 2024)

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
O6.0CA153C01.1	3						3						1	2
O6.0CA153C01.2	2	3					3						2	3
O6.0CA153C01.3			2				3						1	3
O6.0CA153C01.4		2	2		2		3						2	1
O6.0CA153C01.5	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)

O6.0CA100E02: MATLAB

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

Max Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of basic Programming concepts
Course Type: Domain Elective

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

- O6.0CA100E02.1. To learn features of MATLAB as a programming tool.
- O6.0CA100E02.2. To promote new teaching model that will help to develop programming skills and technique to solve mathematical problems.
- O6.0CA100E02.3. To understand MATLAB graphic feature and its applications.
- O6.0CA100E02.4. Interpret and visualize simple mathematical functions and operations thereon using plots/display
- O6.0CA100E02.5. 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 (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (ix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (x) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
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Short/Long Questions:

70%

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
O6.0CA100E02.1	2	3	3	3	3	2	3				2	3	3	3
O6.0CA100E02.2	3	2	3	2	2	1	2			2	2	3	2	3
O6.0CA100E02.3	3	3	3	3	3	1	3		2		2	2	3	3
O6.0CA100E02.4	3	2	2	3	1		2		1			3	2	3
O6.0CA100E02.5	3	3	3	3	2	1	3	2				3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA101E02: SOFT PROGRAMMING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs.

Max. Marks : 100

Continuous Evaluation : 30

End Semester Examination : 70

Pre-Requisite: Basic of AI

Course Type: Domain Elective

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

O6.0CA101E02.1. Learn soft computing techniques and their applications.

O6.0CA101E02.2. Analyze various neural network architectures.

O6.0CA101E02.3. Define the fuzzy systems.

O6.0CA101E02.4. Understand the genetic algorithm concepts and their applications.

O6.0CA101E02.5. Identify and select a suitable Soft Computing technology to solve the problem

O6.0CA101E02.6. 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

Unit 2: Neural Networks:

- 1.1 What is Neural Network
- 1.2 Learning rules and various activation functions
- 1.3 Single layer Perceptron
- 1.4 Back Propagation networks
- 1.5 Architecture of Backpropagation (BP)
- 1.6 Networks, Backpropagation Learning,
- 1.7 Variation of Standard
- 1.8 Back propagation Neural Network,
- 1.9 Introduction to Associative Memory,

Unit 3: Fuzzy Systems:

- 1.1 Fuzzy Set theory
- 1.2 3.2 Fuzzy versus Crisp set
- 1.3 Fuzzy Relation
- 1.4 Fuzzification
- 1.5 Minmax Composition
- 1.6 Defuzzification Method,
- 1.7 Fuzzy Logic
- 1.8 Fuzzy Rule based systems
- 1.9 Predicate logic
- 1.10 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. Vijayalakshmi, 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. https://www.cet.edu.in/noticefiles/274_soft%20computing%20LECTURE%20NOTES.pdf
(Last Visited Date: 22 February, 2024)
2. <http://lancet.mit.edu/ga/dist/galibdoc.pdf> (Last Visited Date:22 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xi) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%

Projects/Group Activities etc

15%

(xii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:

30%

Short/Long Questions:

70%

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
O6.0CA101E02 .1	2	1		2			2						3	3
O6.0CA101E02 .2	1	3	1	1			2						2	2
O6.0CA101E02 .3	1	2	1	1			2						2	3
O6.0CA101E02 .4	1	2	2	3	2		1						3	2
O6.0CA101E02 .5	2	1	1	3	2		2						2	2
O6.0CA101E02 .6	1	1	1		2	2	2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.0CA102E02: Azure Fundamentals

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

Max. Mark: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: NA

Course Type: Domain Specific

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

- 06.0CA102E02.1 Be familiar with the general cloud technology concepts
- 06.0CA102E02.2 Build knowledge of Azure services and Azure workloads.
- 06.0CA102E02.3 Detail knowledge of security and privacy in Azure, Azure pricing and support.
- 06.0CA102E02.4 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

Unit 6: Azure Cost and Optimisation spending

- 6.1 Factors effecting cost
- 6.2 Azure Price Calculator
- 6.3 Estimate total cot with TCO calculator
- 6.4 Save infrastructure & licensing cost
- 6.5 Service life cycle public and private

Suggested Books:

1. James Boyce, Microsoft Certified Azure Fundamentals Study Guide: Exam AZ-900
2. Jim Cheshire, Exam Ref AZ-900 Microsoft Azure Fundamentals
3. Eri, Cloud Computing-Concepts, Technology & Architecture: Pearson Publication

Note: Only latest editions of the books are recommended.

Web links:

- AZ-900 Exam Study Guide (microsoft.com) (last visited date: 22 February 2024)
- <https://infrastructuremap.microsoft.com/explore> (last visited date: 22 February 2024)
- Microsoft Certified: Azure Fundamentals - Certifications | Microsoft Learn (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xiv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.0CA103E02: FUNDAMENTALS OF CLOUD COMPUTING

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

Max. Marks : 100
Continuous Evaluation: 30
End Semester Examination: 70

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:

- O6.0CA103E02.1 Define cloud computing and memorize the different cloud services and deployment models.
- O6.0CA103E02.2 Describe importance of virtualization along with their respective technology.
- O6.0CA103E02.3 Use and examine different cloud computing services.
- O6.0CA103E02.4 Analyze and compare various different cloud computing platforms such as AWS, Microsoft Azure.
- O6.0CA103E02.5 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 (Last visited Date: 21 February, 2024)
- http://www.motc.gov.qa/sites/default/files/cloud_computing_ebook.pdf (Last visited Date: 21 February, 2024)
- http://eddiejackson.net/web_documents/The_Definitive_Guide_to_Cloud_Computing.pdf (Last visited Date: 21 February, 2024)
- <https://ptgmedia.pearsoncmg.com/images/9780133387520/samplepages/0133387526.pdf> (Last visited Date: 23/02/24)
- <http://www.buyya.com/MasteringClouds/ToC-Preface-TMH.pdf>(Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xv) Continuous or formative assessments (in the form of end semester examination or term examination). Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA103E02.1	2		1	1			2						3	3
O6.0CA103E02.2	1	3	1		1		1						2	2
O6.0CA103E02.3	1	2	2	2		2	1						2	3
O6.0CA103E02.4	1	2	2	2	3	2	1						3	2
O6.0CA103E02.5	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)

O6.0CA104E02: CONCEPTS OF AI & MACHINE LEARNING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs.

Max. Marks : 100

Continuous Evaluation : 30

End Semester Examination : 70

Pre-Requisite: Basic of computing.

Course Type: Domain Elective

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

O6.0CA104E02.1 Develop a good understanding of fundamental principles of machine learning.

O6.0CA104E02.2 Understand various Modelling Techniques.

O6.0CA104E02.3 Learn to use machine learning operations for classification and regression.

O6.0CA104E02.4 Analyze the concepts of neural networks for learning linear and non-linear activation functions..

O6.0CA104E02.5 Characterize the machine learning algorithms as supervised and unsupervised learning.

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:

1.1 Prediction Modeling

1.2 Probabilistic interpretation, Regularization,

1.3 Logistic regression, multi class classification

1.4 Support Vector Machines- Large margin classifiers

1.5 Nonlinear SVM,

1.6 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. Ethem Alpaydin, 2020, Introduction to Machine Learning, Prentice Hall of India.
2. Tom Mitchell, 2019, Machine Learning, McGraw Hill Education.
3. Stephen Marsland, 2020, Machine Learning: An Algorithmic Perspective, Chapman and Hall/CRC
4. Christopher M. Bishop, 2017, Pattern Recognition and Machine Learning, Springer

Note: Only latest editions of the books are recommended.

Software required/ Web links:

1. Web Links: <https://www.ibm.com/topics/machine-learning> (Last Visited Date: 21st February, 2024)
2. Web Links: <https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-ml/> (Last Visited Date: 21st February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xvii) Continuous or formative assessments (in the form of end semester examination or term examination). Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA104E02.1	2	1		2			2						3	3
O6.0CA104E02.2	1	3	1	1			2						2	2
O6.0CA104E02.3	1	2	1	1			2						2	3
O6.0CA104E02.4	1	2	2	3	2		1						3	2
O6.0CA104E02.5	2	1	1	3	2		2						2	2
O6.0CA104E02.6	1	1	1		2	2	2						2	2

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06.OCA105E02: PROBABILISTIC REASONING

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs.

Max. Marks : 100

Continuous Evaluation : 30

End Semester Examination : 70

Pre-Requisite: Python Programming

Course Type: Domain Elective

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

O6.OCA105E02.1 The basic principles of probability and random variables.

O6.OCA105E02.2 The skills of extracting probabilistic models from the data with the help of continuous probability distributions and Gaussian approach.

O6.OCA105E02.3 The estimation statistics and decision-making techniques, algorithms which plays vital role in data mining.

O6.OCA105E02.4 Demonstrate advanced knowledge of decision theory for formal computation and its relationship to languages

O6.OCA105E02.5 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:

- 1.1 Deriving the likelihood function
- 1.2 Bayes' rule
- 1.3 Statistical tests and Bayesian model comparison
- 1.4 Bit, Surprisal, Entropy, Source coding theorem
- 1.5 Joint entropy, Conditional entropy
- 1.6 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/> (Last Visited Date: 23rd February, 2024)
2. <https://www.coursehero.com/sitemap/schools/2655-University-of-Edinburgh/courses/1641949-INFORMATICPMR/#> (Last Visited Date: 23rd February, 2024)
3. [8.2.6-FromBNtoMN.ppt \(buffalo.edu\)](#) (Last Visited Date: 23rd February, 2024)
4. <http://www.cs.toronto.edu/~yangxu/information-theory-v3.pdf> (Last Visited Date: 23rd February, 2024)
5. <http://www.stat.cmu.edu/~larry/=sml/Bayes.pdf> (Last Visited Date: 23rd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (ix) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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	
O6.0CA105E02.1	2	1		2			2						3	
O6.0CA105E02.2	1	3	1	1			2						2	
O6.0CA105E02.3	1	2	1	1			2						2	
O6.0CA105E02.4	1	2	2	3	2		1						3	
O6.0CA105E02.5	2	1	1	3	2		2						2	
O6.0CA105E02.6	1	1	1		2	2	2						2	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.0CA106E02: NETWORK SECURITY

Periods/week Credits

L:2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination : 70

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:

O6.0CA106E02.1 Analyze the basic concepts of network security.

O6.0CA106E02.2 Recognize various security threats, their harm, strategies and tactics to protect the networks.

O6.0CA106E02.3 Explore various aspects of network security and access control mechanism.

O6.0CA106E02.4 Network Security Policy Design and Implementation.

O6.0CA106E02.5 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

- 1.1 Secure Firewall Configuration and Management,
- 1.2 Understanding firewalls,
- 1.3 Understanding firewall security concerns,
- 1.4 Describing various firewall technologies,
- 1.5 Describing firewall topologies,
- 1.6 Appropriate selection of firewall topologies,
- 1.7 Designing and configuring firewall ruleset,
- 1.8 Implementation of firewall policies,
- 1.9 Explaining the deployment and implementation of firewall,
- 1.10 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

Web links:

[https://www.tutorialspoint.com/ Network security/index.htm](https://www.tutorialspoint.com/Network%20security/index.htm) (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxi) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%

Projects/Group Activities etc 15%

(xxii) For Summative assessment (End Semester Examination or End-Term Examination):
 Minimum: 70 percent. Categorization for the same is:
 Objective Type Questions: 30%
 Short/Long Questions: 70%

Assessment Tools:

Assignment / Tutorials
 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
O6.OCA106E02 .1	2					1	2	1					3	3
O6.OCA106E02 .2	1	3	1		3		1						2	2
O6.OCA106E02 .3			2	2		3	1							
O6.OCA106E02 .4	1	2					1						1	1
O6.OCA106E02 .5	2	3	1	3		1	3	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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O6.OCA107E02: CYBER SECURITY

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

Max. Marks : 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: NA

Course Type: Domain Elective

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

- O6.OCA107E02.1. Understand basic concepts and issues related to Cyber Security.
- O6.OCA107E02.2. Distinguish various tools used in Cyber Security.
- O6.OCA107E02.3. Identify various mechanisms to protect themselves from various security threats on the internet.
- O6.OCA107E02.4. Use security tools to enhance system security.
- O6.OCA107E02.5. 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.w3schools.com/cybersecurity/> (Last Visited Date: 22nd February, 2024)

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 14 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xxiv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:	
Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA107E02 .1	2		1	1			2						3	3
O6.0CA107E02 .2	1	3	1		1		1						2	2
O6.0CA107E02 .3			2	2		2	1							
O6.0CA107E02 .4	1	2					1							
O6.0CA107E02 .5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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NAAC 'A++' Grade University

06.OCA108E02: GAMING TECHNOLOGY - I

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

Max. Marks: 100
Continuous Evaluation: 30
End Sem Examination: 70

Pre-requisites: Basic knowledge of computer graphics and gaming

Course Type: Program Elective

Course Outcomes: The students would be able:

- O6.0CA108E02.1. To learn Game Essentials, Types of Games, Stages of Design process.
- O6.0CA108E02.2. To understand requirements of designing a game.
- O6.0CA108E02.3. To learn how a concept turns into a game, and game world
- O6.0CA108E02.4. To create a expressive play, characters in the game
- O6.0CA108E02.5. To understand what a storytelling is, various components of storytelling
- O6.0CA108E02.6. 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, Introduction to Programming Through Game Development Using Microsoft XNA Game Studio, Academic Edition, Microsoft Press.
2. Finney, Kenneth C, Advanced 3D game programming all in one, First edition, Course Technology Press.
3. Michael Chung, Game Programming Paradigms, Pocket Gems.
4. La Mothe, André, 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> Last Visited Date: 22-02-2024
2. <https://gamedevacademy.org/how-to-make-a-game/> Last Visited Date:22-02-2024

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxv) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xxvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO Statement	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PSO 2
O6.0CA108E02.1	3	2	2	1	2	2	1	1	1	2	2	2	2	1
O6.0CA108E02.2	3	3	2	2	2	2	1	1	2	2	2	2	2	1
O6.0CA108E02.3	3	2	2	2	2	2	2	1	2	2	2	2	2	2
O6.0CA108E02.4	3	3	2	2	2	2	2	1	2	2	2	2	2	3
O6.0CA108E02.5	3	2	2	2	2	2	2	1	1	2	2	2	2	3
O6.0CA108E02.6	3	3	2	3	2	2	2	1	2	3	3	1	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA109E02: ADVANCED WEB TECHNOLOGIES

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

Max. Marks: 100
Continuous Evaluation : 30
End Semester Examination : 70

Pre-Requisite: Web Development concepts

Course Type: Domain Elective

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

O6.0CA109E02.1 Create UI applications using C#

O6.0CA109E02.2 Design and develop secure web applications using asp.net according to industry standards

O6.0CA109E02.3 Define and create custom web services

O6.0CA109E02.4 Apply the concept of Servlet and its life cycle to create web application.

O6.0CA109E02.5 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> (Last Visited Date: 22nd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxvii) Continuous or formative assessments (in the form of end semester examination or term examination). Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xxviii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA109E02.1	3	3	2	2	3		3						3	1
O6.0CA109E02.2	1	1	2	3	1		2						3	1
O6.0CA109E02.3	1	2	2	1	2								2	1
O6.0CA109E02.4	1	1	2	1	1		3						1	2
O6.0CA109E02.5	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)

06.0CA110E02: MOBILE COMPUTING BASICS

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

Max. Marks : 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Computer Networks

Course Type: Domain Elective

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

- O6.0CA110E02.1 Define the concept of wireless communication & design of various cellular systems.
- O6.0CA110E02.2 Describe working principle of wireless LAN and its standards.
- O6.0CA110E02.3 Explain various techniques of multiple user access to scarce radio spectrum resources.
- O6.0CA110E02.4 Compare different protocols for mobile adhoc networks
- O6.0CA110E02.5 Analyze the working of the GPS system and the concept of location-based routing.
- O6.0CA110E02.6 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 (Last visited Date: 21 February, 2024)
- https://sgar91.files.wordpress.com/2011/10/mobile_communications_schiller_2e.pdf (Last visited Date: 21 February, 2024)
- <http://freeofread.com/download/mobile-computing-talukdar/> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(xxx) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

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
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O6.0CA110E02.2	1	3	1		1		1						2	2
O6.0CA110E02.3	1	2	2	2		2	1						2	3
O6.0CA110E02.4	1	2	2	2	3	2	1						3	2
O6.0CA110E02.5	2	3	2	2		2	2	1					2	2
O6.0CA110E02.6	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)

06.0CA111E02: MOBILE SOFTWARE TECHNOLOGIES

Periods/week	Credits	Max. Marks: 100
L: 2 T: 0	2	Continuous Evaluation: 30
Duration of Examination: 3 Hrs		End Semester Examination: 70

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:

- 06.0CA111E02.1 Install and configure Android application development tools.
- 06.0CA111E02.2 Design and develop user Interfaces for the Android platform.
- 06.0CA111E02.3 Save state information across important operating system events.
- 06.0CA111E02.4 Apply Java programming concepts to Android application development.
- 06.0CA111E02.5 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 Ashwinin 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> (Last visited Date: 21 February, 2024)
- <https://www.w3schools.com/appml/> (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xxxii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA111E02.1	2		1	1			2						3	3
O6.0CA111E02.2	1	3	1		1		1						2	2
O6.0CA111E02.3	1	2	2	2		2	1						2	3
O6.0CA111E02.4	1	2	2	2	3	2	1						3	2
O6.0CA111E02.5	2	3	2	2		2	2	1					2	2
O6.0CA111E02.6	3	2	2	1		1	2						2	2

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MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA112E02: DIGITAL METHODS I: PHOTOSHOP, ILLUSTRATOR

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

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:

O6.0CA112E02.1 Develop critical and creative thinking skills and perceptual awareness necessary for understanding and producing designs using specific design programs.

O6.0CA112E02.2 Understand and apply media, technology, and processes.

O6.0CA112E02.3 Organize the components of a work into a cohesive whole through knowledge of organizational principles of design and art elements.

O6.0CA112E02.4 Evaluate a range of subject matter and ideas to communicate intended meaning in designs through innovative methods.

O6.0CA112E02.5 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 module.

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> (Last Visited Date: 22-02-2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxxiii) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

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Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:
Short/Long Questions:

30%
70%

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
O6.0CA112E02 .1					1	1	1		1	1	1		1	1
O6.0CA112E02 .2					1	1	1		1	1	1		1	1
O6.0CA112E02 .3					1	1	1		1	1	1		1	1
O6.0CA112E02 .4					1	1	1		1	1	1		1	1
O6.0CA112E02 .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)

O6.0CA113E02: ANIMATION FUNDAMENTALS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Basic Knowledge of computers is required

Course Type: Domain Elective

Course Outcomes: Students will be able to –

O6.0CA113E02.1. Understand the basic concept of computer graphics, Graphic devices, Graphics APIs, Graphics Pipeline, Open Source 3D computer graphics software/tools.

O6.0CA113E02.2 Describe and identify the concept of Typography, Typesetting, Handwriting & Calligraphy, Graffiti, Architectural lettering.

O6.0CA113E02.3. Apply the concept of Color theory, Color wheel, Color systems, page Layout, User interface design

O6.0CA113E02.4. Analyze the Blender open source tool to design the Graphics and Animation.

O6.0CA113E02.5. Evaluate the GIMP and Movie sandbox open source tool to design the Graphics and Animation.

O6.0CA113E02.6. 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> Last Visited Date:22.02.2024
[http://en.wikipedia.org/wiki/Blender_\(software\)](http://en.wikipedia.org/wiki/Blender_(software)) Last Visited Date:22.02.2024
<http://www.mopi.nl/blogo/> Last Visited Date:22.02.2024
<http://www.blender.org/blenderorg/blender-foundation/history/> Last Visited Date:22.02.2024
<http://www.blender.org/BL/> Last Visited Date:22.02.2024
<http://www.blender.org/development/release-logs/blender-248/> Last Visited Date:22.02.2024
<http://www.gimp.org/> Last Visited Date:22.02.2024
<http://www.gimp.org/features/> Last Visited Date:22.02.2024
<http://www.moviesandbox.net/> Last Visited Date:22.02.2024
http://wiki.moviesandbox.net/index.php?title=Main_Page Last Visited Date:22.02.2024

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxxv) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs

30%

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA114E02: BASICS OF E-COMMERCE

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks : 100

Continuous Evaluation : 30

End Semester Examination: 70

Pre-Requisite: Knowledge of Internet

Course Type: Domain Elective

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

06.0CA114E02. 1: Understand the fundamentals and importance of E-Commerce.

06.0CA114E02.2: Classify trading relationships including Business to Consumer, Business-to-Business, Inter-organization.

06.0CA114E02.3: Interpret the key features of Internet, Intranets and Extranets by demonstrating their relation with each other.

06.0CA114E02.4: Analyze the major security challenges in using and making On-line transactions.

06.0CA114E02.5: Examine the legal issues and Privacy in E-Commerce.

06.0CA114E02..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
- 3.14 Digital Signature

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 (Last visited Date: 21 February, 2024)
- <https://www.bestcourse4u.com> > What is e-commerce (Last visited Date: 21 February, 2024)
- <https://ecommerceguide.com/guides> (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xxxvii) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(xxxviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA114E02.1			1		2	3	1	1	1				1	1
O6.0CA114E02.2		1	1		2	2	1			2		1	1	
O6.0CA114E02.3		1	1	1	1	2	1		1	1			1	1
O6.0CA114E02.4		1			1	2	1			1	2		1	1
O6.0CA114E02.5		1	1		1	2	1			1	1		1	
O6.0CA114E02.6	1	1			1	2	1	1		1	1	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA115E02: INTRODUCTION TO OPEN SOURCE SOFTWARE AND OPEN STANDARDS

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

Max. Marks : 100
Continuous Evaluation: 30
End Semester Examination:70

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

Course Outcomes:

O6.0CA115E02.1 Gain knowledge of Open Standards including evolution of open standards.

O6.0CA115E02.2 Gain knowledge about the standard setters with clear differentiation between De Jure and De facto standard setters.

O6.0CA115E02.3 Gain knowledge about the adoption of open standards along with case studies.

O6.0CA115E02.4 Gain knowledge of open-source software including operating system LINUX and graphical user interface etc.

O6.0CA115E02.5 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, 2008.

Weblinks:

1. <http://www.oasis-open.org/org>. (Last visited Date: 21 February, 2024)
2. <http://www.odfalliance.org/> (Last visited Date: 21 February, 2024)
3. <http://www.iso.org>.(Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xxxix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xl) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
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MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.OCA116E02: IOT BASICS AND TECHNOLOGY

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

Max. Marks : 100
Continuous Evaluation : 30
End Semester Examination: 70

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:

- O6.OCA116E02.1. Interpret the vision of IoT & explain in a concise manner how Internet of Things work
- O6.OCA116E02.2. Understand the basics of IoT networking, communication protocols, & sensor networks
- O6.OCA116E02.3. Use & application of wireless technologies and mobile networks for Internet of Things
- O6.OCA116E02.4. Compare and contrast the use of devices, gateways and data management in IoT
- O6.OCA116E02.5. Interfacing of sensing devices & implementation of IoT using Arduino & Raspberry Pi
- O6.OCA116E02.6. 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> (Last visited Date: 21 February, 2024)
- <https://nptel.ac.in/courses/106105166/#> (Last visited Date: 21 February, 2024)
- <https://geekflare.com/internet-of-things-iot-learning-resources/> (Last visited Date: 21 February, 2024)
- https://onlinecourses.nptel.ac.in/noc22_cs53/preview (Last visited Date: 21 February, 2024)
- <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT> (Last visited Date: 21 February, 2024)

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Evaluation Policy:

The evaluation will include two types of assessments:

- (xii) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(xlii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA116E02.1	1		1	1	2		2						2	1
O6.0CA116E02.2	1	1	2	3	1		2						3	2
O6.0CA116E02.3	2	2	1	1	2								2	1
O6.0CA116E02.4	1	2	2	1	1		2						1	2
O6.0CA116E02.5	1	1	2	1			2	3					2	2
O6.0CA116E02.6	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)

06.OCA117E02: HARDWARE ARCHITECTURES

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

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:

- O6.OCA117E02.1. Learn the functional block diagram of a single bus architecture of a computer.
- O6.OCA117E02.2. Describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
- O6.OCA117E02.3. Demonstrate assembly language program for specified microprocessor for computing 16-bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
- O6.OCA117E02.4. Categorize & describe the process for Concurrent access to memory and cache coherency in Parallel Processors.
- O6.OCA117E02.5. Compare different CPU organizations and instructions and will be able to design a memory module and able to analyse its operation by interfacing with the CPU.
- O6.OCA117E02.6. 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> (Last visited Date: 21 February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xliv) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xlv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA117E02.1	2			1						1		2	-	2
O6.0CA117E02.2	3	3			2	1	2			2			2	2
O6.0CA117E02.3		3	3	2				1	1					2
O6.0CA117E02.4	2	3		2		2			1	1		3	2	2
O6.0CA117E02.5	3			2	1	-	2	1	2			3		2
O6.0CA117E02.6	3			2	2			2	2	2	2	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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06.OCA118E02: PROBABILITY AND STATISTICS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of basic mathematics

Course Type: Domain Elective

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

- 06.OCA118E02.1. Learn the language and core concepts of probability theory
- 06.OCA118E02.2. Interpret the ability to solve problems based on basic principles of statistical inference.
- 06.OCA118E02.3. Relate Statistical Techniques in other domains of study.
- 06.OCA118E02.4. Examine the impact of Skewness and outliers on the various statistical interpretations.
- 06.OCA118E02.5. Develop critical reasoning by studying statistical concepts
- 06.OCA118E02.6. Apply various types of statistical tools & Linear Programming in research & real-time problems.

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 multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xlv) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xlvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA118E02.1	1		1	1	2		3						2	3
O6.0CA118E02.2	1	1	2	3	1		2						3	3
O6.0CA118E02.3	1	2	0	1	2								3	1
O6.0CA118E02.4	1		2	1	1		3						1	3
O6.0CA118E02.5	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

06.0CA119E02: INTRODUCTION TO DATA SCIENCE

Periods/week Credits
L :2 T: 0 2.0

Duration of Exam: 3 Hrs

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Basic Knowledge of Mathematics and Python

Course Type: Domain Elective

Course Outcomes: Students will be able to –

- O6.0CA119E02.1 Demonstrate proficiency with statistical analysis of data.
- O6.0CA119E02.2 Execute statistical analyses with professional statistical software.
- O6.0CA119E02.3. Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively.
- O6.0CA119E02.4. ability to build and assess data-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/> (last visited date: 22 February 2024)
- <https://www.javatpoint.com/data-science> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xlvii) Continuous or formative assessments (in the form of end semester examination or term examination). Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xlviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA119E02.1	2	2		3	2		2					1		1
O6.0CA119E02.2	2	1	2	1	1		1						3	2
O6.0CA119E02.3	2		1	1	2							1		2
O6.0CA119E02.4	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)

O6.0CA120E02: INTRODUCTION TO BLOCKCHAIN

Periods/week Credits

L: 2 T: 0 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation : 30

End Semester Examination : 70

Pre-Requisite: Fundamentals of Cybersecurity

Course Type: Domain Elective

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

O6.0CA120E02.1. Understand the concepts of Blockchain

O6.0CA120E02.2. Know about usage of the protocols

O6.0CA120E02.3. Understand the hyper ledger fabric

O6.0CA120E02.4. Learn the implementation of the blockchain

O6.0CA120E02.5. Learn about application of Blockchain in Financial Systems

O6.0CA120E02.6. Learn about application of Blockchain in Trade and Supply

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

1.1 **Decomposing the consensus**

1.2 **Hyperledger fabric components**

1.3 Design and Implementation of Hyperledger Fabric

1.4 fabric SDK and Front End

1.5 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 6: 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> (Last visited date: 23rd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xlix) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (l) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14
O6.0CA120E02 .1	2		1	2	1		2			1			3	1
O6.0CA120E02 .2	1			1			3	1		1	2	1	2	
O6.0CA120E02 .3	2		2		1	1			1		2		2	
O6.0CA120E02 .4	1		1	2			3	1	3		2		3	2

O6.0CA120E02. 5		1	1		2		3	1			2		1	
O6.0CA120E02. 6	2		3		1		3		2		3		1	3

MRPDRS

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

06.0CA121E02: BLOCK CHAIN IMPLEMENTATION & APPLICATIONS

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

Max. Marks: 100
Continuous Evaluation : 30
End Semester Examination : 70

Pre-Requisite: Blockchain

Course Type: Domain Elective

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

- O6.0CA121E02.1. Contentedly discuss and describe the history, types and applications of Blockchain
- O6.0CA121E02.2. Gain familiarity with cryptography and Consensus algorithms.
- O6.0CA121E02.3. Create and deploy projects using Web3j.
- O6.0CA121E02.4. 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

- 1.1 Blockchain Network and Nodes, Peer-to-Peer Network
- 1.2 Mining Mechanism
- 1.3 Generic elements of Blockchain
- 1.4 Features of Blockchain
- 1.5 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

- 1.1 Project presentation
- 1.2 Futures smart contract: Blockchain
- 1.3 Oracles- Web3j: Setting up the Web3J- Installing web3j
- 1.4 Wallet creation
- 1.5 Java client: The wrapper generator
- 1.6 Initializing web3j- Setting up Ethereum accounts
- 1.7 Deploying the contract Aliases and pre-qualifier

Unit 5: Blockchains in Business and creating

- 1.1 Public versus private and permissioned versus permission less blockchains
- 5.2 Privacy and anonymity in Ethereum-
- 1.2 The Ethereum Enterprise Alliance Blockchain as-a-Service- Initial Coin Offering (ICO)
- 1.3 Project setup for ICO implementation- Token contracts-
- 1.4 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

- <https://www.ibm.com/products/blockchain-platform-hyperledger-fabric> (last visited date: 22 February 2024)
- <https://www.oracle.com/in/blockchain/> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (i) Continuous or formative assessments (in the form of end semester examination or term examination).
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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (ii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA121E02.1	1		1	2	2		3						3	1
O6.0CA121E02.2	1	1	2	3	1		2						3	1
O6.0CA121E02.3	1	2	2	1	2								2	1
O6.0CA121E02.4	1	1	2	1	1		3						1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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O6.0CA122E02: DEVOPS ESSENTIALS

Periods/week Credits

L: 2 T: 0 P:0

Duration of Examination: 3 Hrs

Max. Marks : 100

Continuous Evaluation : 30

End Semester Examination : 70

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:

- O6.0CA122E02.1. Define discuss the key concepts and principles of DevOps.
- O6.0CA122E02.2. Learning the basics of Git, version control, and repositories..
- O6.0CA122E02.3. Utilize Jenkins for automation and continuous integration to streamline software development processes
- O6.0CA122E02.4. Understanding the concept of treating infrastructure as code.
- O6.0CA122E02.5. Learning Docker fundamentals, containers, and images.
- O6.0CA122E02.6. Exploring monitoring and Implementing effective logging practices for troubleshooting.

PART-A

UNIT 1: Introduction to DevOps

- 1.1 Introduction to DevOps and its importance in software development
- 1.2 DevOps Principles
- 1.3 DevOps Benefits
- 1.4 DevOps Culture
- 1.5 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
- 3.2 Setting up Jenkins for continuous integration
- 3.3 Building and testing code with Jenkins
- 3.4 Jenkins Installation and Configuration
- 3.3 Introduction to continuous delivery
- 3.4 Setting up Jenkins for continuous delivery
- 3.5 Deploying code with Jenkins Jobs

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 Building and deploying containers with Docker Functions of Transport Layer
- 5.4 Introduction to container orchestration
- 5.5 Understanding Kubernetes and its features
- 5.6 Deploying and managing applications with Kubernetes

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, 2019, The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Revolution press.
2. Jez Humble and David Farley, 2018, 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/market/course/industrial_engineering_operations_research/index.jsp (Last Visited Date: 21st February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (liii) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (liv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA122E02.1	3	1		1	2			1			1		1	
O6.0CA122E02.2		3			2							1	2	2
O6.0CA122E02.3			3		2		2			1			2	1
O6.0CA122E02.4		3			2						1		1	
O6.0CA122E02.5	1			3		2							2	2
O6.0CA122E02.6	3		3					2					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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06.0CA123E02: AWS SERVICES

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Computer Network

Course Type: Domain Elective

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

O6.0CA123E02.1. Identify and understand the concept of AWS

O6.0CA123E02.2. Understand the concept of cloud storage over the traditional storage

O6.0CA123E02.3. Analyse the concept of a Virtual private cloud

O6.0CA123E02.4. Apply the concept of configuring Auto Scaling for real Application Infrastructure

O6.0CA123E02.5. 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> (Last Visited Date: 22nd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (iv) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (vi) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

MRIPS

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA123E02.1	1		1	2	2		2						3	1
O6.0CA123E02.2	1	1	2	3	1		2						3	1
O6.0CA123E02.3	1	2	1	1	2								2	1
O6.0CA123E02.4	1	1		1	1		3						1	2
O6.0CA123E02.5	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

O6.0CA124E02: FUNDAMENTALS OF COMPUTER NETWORKS

Periods/week Credits
L :2 T: 0 2.0

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Duration of Exam: 3 Hrs

Pre-Requisite: Basic Knowledge of Animation is required

Course Type: Domain Elective

Course Outcomes: Students will be able to –

- O6.0CA124E02.1. Explain basic concepts, OSI reference model, services and role of each layer of OSI model.
- O6.0CA124E02.2 Describe and assign the IP addresses.
- O6.0CA124E02.3. Understand the various protocols in Wireless Networking
- O6.0CA124E02.4. 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

- 1.1 Characteristic of TCP/IP
- 1.2 The TCP/IP Model
- 1.3 IPv4 Addressing
- 1.4 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

- 1.1 Designing TCP/IP based Networks
- 1.2 TCP/IP Mail Services
- 1.3 TCP/IP Utilities

1.4 Implementing TCP/IP in the Command Line

UNIT 5: Virtual Networks and Network Security

- 1.1 Virtual Networks and VLANs
- 1.2 Remote Access
- 1.3 VPNs
- 1.4 Network Security & Security Risks
- 1.5 Encryption
- 1.6 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> (last visited date: 22 February 2024)
https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm(last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (lvii) Continuous or formative assessments (in the form of end semester examination or term examination).
Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (lviii) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA124E02.1	2	2		3	2		2					1		1
O6.0CA124E02.2	2	1	2	1	1		1						3	2
O6.0CA124E02.3	2		1	1	2							1		2
O6.0CA124E02.4	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)

06.0CA125E02: ROUTING PROTOCOLS AND ARCHITECTURES

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

Pre-Requisite: Fundamentals of Computer Networks

Course Type: Domain Specific

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

O6.0CA125E02.1. Understand basic concept of Routing in Computer Networks.

O6.0CA125E02.2. Explore various Routing Protocols and their Characteristics.

O6.0CA125E02.3. Understand the concept of Routing Algorithm and Apply different routing protocols over network layer and transport layer.

O6.0CA125E02.4. Analyze different routing protocols requires to be configured in real routers along with the framework of the concerned routing algorithms.

O6.0CA125E02.5. 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> (last visited date: 22 February 2024)
<https://www.tutorialspoint.com> (last visited date: 22 February 2024)
www.tutorialspoint.com/listtutorials/networking/1 Last Visited Date: 23.02.2024

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (lix) Continuous or formative assessments (in the form of end semester examination or term examination). Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (lx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
---------------------------	-----

Short/Long Questions:

70%

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
O6.0CA125E02.1		2		1		1	3						2	1
O6.0CA125E02.2	2	2	2				3			1			3	2
O6.0CA125E02.3		3		1			2						2	
O6.0CA125E02.4	2	3			1		2		1		1		1	2
O6.0CA125E02.5	2	1	1		2		3			1				

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.0CA126E02: AUGMENTED REALITY FOUNDATIONS

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

Max. Marks : 100
Continuous Evaluation : 30
End Semester Examination: 70

Pre-Requisite: Nil

Course Type: Domain Elective

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

- O6.0CA126E02.1. Historical and modern overviews and perspectives of Augmented Reality
- O6.0CA126E02.2. Understand the technologies, components and hardware needed for AR
- O6.0CA126E02.3. Implement the AR and hand-on preparation
- O6.0CA126E02.4. Impart the importance of augmented reality with real-time examples
- O6.0CA126E02.5. Gain knowledge of software tools required for AR
- O6.0CA126E02.6. 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/> (last visited date: 22 February 2024)
- <https://www.geeksforgeeks.org/basics-augmented-reality/> (last visited date: 22 February 2024)
- <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/all-about-augmented-reality> (last visited date: 22 February 2024)
- <https://www.youtube.com/watch?v=WzfDo2Wpxks> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (Ixi) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%

Projects/Group Activities etc

15%

(lxii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:

30%

Short/Long Questions:

70%

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
O6.0CA126E0 2.1	2	2		3	2		2					1		1
O6.0CA126E0 2.2	2	1	2	1	1		1						3	2
O6.0CA126E0 2.3	2		1	1	2							1		2
O6.0CA126E0 2.4	1	2	2	3	1		2						1	2
O6.0CA126E0 2.5		1	2	1			2	3				1	2	3
O6.0CA126E0 2.6	1	1	1	1	1		2	2				2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
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06.0CA127E02: ANIMATION & RENDERING TECHNIQUES

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 –

- O6.0CA127E02.1. Understand the basic concept of computer graphics, Graphic devices, Graphics APIs, Graphics Pipeline, open-source 3D computer graphics software/tools.
- O6.0CA127E02.2 Describe and identify the concept of Character setup.
- O6.0CA127E02.3. Apply the concept of 3D Muscle system in Animation
- O6.0CA127E02.4. Analyze the Surfacing concept and its practical usage in Animation.
- O6.0CA127E02.5. Evaluate the role of 3D Lighting to design the Graphics and Animation.
- O6.0CA127E02.6. Create different Animations using different tools and Rendering

Unit-1: Introduction to Computer Graphics and Animation

Introduction, History of computer graphics
Graphics Design overview, Types of computer graphics
2D & 3D computer graphics, Graphics areas, Graphic devices
Display techniques.
Major applications, Graphics APIs, Graphics Pipeline
Graphics transformation.
Open source 2D & 3D computer graphics software/tool
2D/3D Graphics Primitives

Unit-2: Introduction to Character setup

Riggers role & Criteria for a good rig
Joints and skeletons, Creating skeleton hierarchy, Constraints
Forward (FK) and Inverse kinematics (IK), FK, IK joint structures
Animation controllers, Blend shapes, Clusters, Biped Rig- Analyzing reference
Anatomy of human body, Bone placements, Setting up Torso, Biped Arms, Fingers, Legs/Foot controls,
Skinning,
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

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

Unit -4: Surfacing

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

Unit -5: 3D Lighting

Directional lights
Spot lights,
Types of lights in 3D space,
Light attributes,
3 Point lighting, 2 Point lighting,
Shadows, photo real environmental lighting

Unit- 6: Rendering

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

Suggested Books:

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

Software required/Weblinks:

<http://www.blender.org> Last Visited Date:22-02-2024
<http://www.gimp.org/> Last Visited Date: 22-02-2024
<http://www.moviesandbox.net/> Last Visited Date: 22-02-2024

Guidelines for the End Semester Question Paper:

The question paper will be divided into 2 parts, with one question in Part A and four questions in Part B. The questions will be of 20 marks each.

In Part A, the first question will consist of 10 conceptual questions (2 marks each) covering the entire syllabus and all the COs (up to BTL 3). There will be no choice in question 1.

In Part B (question number 2 to 5), there can be an internal choice between each of the questions covering the same (set) of COs and BTL. All COs will be covered in Part B.

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	PO 10	PO 11	PO 12	PSO 1	PSO 2
O6.0CA127E02.1	-	1	-	2	3	-	-	-	-	-	-	-	-	1
O6.0CA127E02.2	-	1	-	2	3	-	-	-	-	-	-	-	-	1
O6.0CA127E02.3	-	1	2	-	-	-	-	-	-	-	-	-	-	-
O6.0CA127E02.4	-	-	-	2	3	-	-	-	-	-	-	-	2	-
O6.0CA127E02.5	-	-	-	2	-	-	-	-	-	-	-	-	2	-
O6.0CA127E02.6	-	-	-	2	3	-	-	-	-	-	-	-	3	-

Manav Rachna International Institute of Research and Studies
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06.0CDC196C05: Placement Competency Enhancement-I

L T P Credits
6 1

Duration of Examination: 2 Hrs

Total Marks: 100

Continuous Evaluation: 50

End Semester Examination: 50

Mode of End-Term Examination: Online + Practical

Course Type: SEC

Course Outcomes: The students will be able to:

- 6.0CDC196C05.1: Enhance their reading and writing skills and accurately construct simple and complex sentences.
- 6.0CDC196C05.2: Enhance their personal effectiveness and become proficient in acing interviews.
- 6.0CDC196C05.3: Solve problems based on verbal reasoning
- 6.0CDC196C05.4: Solve problems based on number system, Percentage, Profit, Ratio, Time, Speed Distance
- 6.0CDC196C05.5: Apply advanced problem-solving techniques encompassing algorithms, arrays, searching, sorting, strings, recursion, OOP, and bit manipulation to solve complex programming challenges effectively.
- 6.0CDC196C05.6: Demonstrate competence in integrating algorithmic thinking and Object-Oriented Programming principles to develop solutions for real-world problems.

PART – A (VERBAL ABILITY)

Unit 1: Communication Accuracy

Relevance of Verbal Ability and Preparatory Guidelines
Functional Grammar – Subject Verb Agreement
Tenses – Perfect, Simple, Continuous
Common Errors and rectification, Idioms and Phrases
Word Power Building Skills - Root word technique, antonyms, synonyms, verbal analogies

Unit 2: Reading & Writing Skills

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

PART – B (INTERVIEW ENHANCEMENT)

Unit 3: Personal Effectiveness

Communication Enhancement
Teamwork, Leadership & Entrepreneurship Skills
Time Management
Design Thinking
Managing Personal Finance

Unit 4: Interview Preparation-1

Developing the employability mindset and Researching the employer
Preparing for Self -Introduction
Drafting Cover letters / Emails
Dressing Do's & Don'ts
4.5 Group Discussion

PART – C (APTITUDE)

Unit 5: Arithmetic

Numbers
Percentages
Profit and Loss
Simple Interest & Compound Interest
Ratio & Proportion
Partnership
Time Speed & Distance

Unit 6: Reasoning

Blood Relation
Coding Decoding
Direction Sense

PART – D

Unit 7: Problem Solving

Mathematical Algorithm: Foundational problems (Factorial, HCF, GCD, LCM), Prime Number & Factorization, Sieve Algorithm.

7.1. Advance Patterns (based on Loops, Conditional statement)

Unit 8: Array

8.1. Array 1D & 2D: Static, Dynamic size, Kadane's algorithm
8.2. 2-pointer approach (same direction with same pace, same direction with different pace, and opposite direction)
8.3. Sliding window technique

Unit 9: Searching & Sorting

9.1 Linear, Binary Search (iterative and recursive),
9.2. Problem-solving using various sorting algorithms

Unit 10: Strings

10.1. String ASCII codes, Anagram, Substring & Subsequence
10.2. Pattern searching (Naive Algorithm, KMP Algorithm, Z algorithm, Boyer Moore Algorithm)
10.3. Rabin Karp Algorithm

Unit 11: Recursion

11.1. Boundary/Corner base case condition, Tail recursion
11.2. Recursion using arrays and strings

Unit 12: OOPS & Bit Manipulation

12.1. Class, objects, Constructors, Static members, Function overloading and related concepts, Abstraction, Encapsulation, Inheritance, Polymorphism
12.2. Bit Manipulation and Bitmasking

Recommended Texts and Readings:

1. Aggarwal, R. S. (2018). Quantitative aptitude for competitive exams (7th ed.). S. Chand & Company Pvt. Ltd.
2. Sharma, A. (2014). How to prepare for logical reasoning for CAT (4th ed.). Tata McGraw Hill Education.
3. Wren, P. C., & Martin, H. (2017). High school English grammar and composition (Revised ed.). S. Chand & Company Pvt. Ltd.

4. Lewis, N. (2015). Word power made easy (1st ed.). Penguin Random House Pvt. Ltd.
Prasoon, S. Group discussion

MRIRRS

5. Reed, J. (2017). Why you? 101 interview questions you'll never fear again (1st ed.). Penguin Books.
6. Karumanchi, N. (2016). Data structures and algorithms made easy (5th ed.). CareerMonk Publications.
7. <https://www.forbes.com/sites/bernardmarr/2022/07/26/10-most-important-leadership-skills-for-the-21st-century-workplace-and-how-to-develop-them/?sh=70b7ec254de6> (Last accessed - May 17, 2024)

Assessment Tools:

- Continuous Assessment: Assignments/ Activities/ Quiz
- Sessional examination (Online mode) at 2nd sessional
- Term-end examination (Practical + Online mode)

Internal Marks Distribution:

Sessional examination (At the time of 2nd sessional)	30 marks
Continuous assessment	15 marks
Attendance	5 marks

Course Articulation Matrix:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CDC196C05.1	2	-	-	-	-	-	-	-	2	-	-	-	2	-
O6.0CDC196C05.2	-	-	-	-	-	3	3	-	-	-	-	-	3	3
O6.0CDC196C05.3	-	2	-	-	-	-	-	-	-	-	-	-	2	-
O6.0CDC196C05.4	-	2	-	-	-	-	-	-	-	-	-	-	2	-
O6.0CDC196C05.5	-	3	3	-	2	1	-	-	-	-	-	2	-	2
O6.0CDC196C05.6	-	3	3	-	-	1	-	-	-	-	2	2	-	2

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06.0CA100C09: Fundamentals of Computer Programming

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: None

Course Type: Bridge

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

06.0CA100C09.1 Understand the structured programming designs and the basic elements of Computer Programming

06.0CA100C09.2 Describe and differentiate various types of Open Source Software

06.0CA100C09.3. Construct program code using simple and nested selection/decision control structure to make decision.

06.0CA100C09.4. Use pre& post tested loop/repetitive control structure while writing program code to process same sequence of tasks/activities.

06.0CA100C09.5. 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> (last visited date: 22 February 2024)
<https://www.cprogramming.com/tutorial/c-tutorial.html> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (lxiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (Ixiv) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:
- | | |
|---------------------------|-----|
| Objective Type Questions: | 30% |
| Short/Long Questions: | 70% |

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

MARKERS

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1 2	PSO 1	PSO 2
O6.0CA100C09. 1	1				2	1	3	2	1	-			2	1
O6.0CA100C09. 2		3	2	1			3			3		1		3
O6.0CA100C09. 3	1	3	2	2	2				1				2	1
O6.0CA100C09. 4	2	1		1	2							1	2	2
O6.0CA100C09. 5	1	1	2		2	1				2			2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
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O6.0CA101C09: ELEMENTS OF MATHEMATICS

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

Max. Marks : 100
Continuous Evaluation : 30
End Semester Examination : 70

Pre-Requisite: None

Course Type: Fundamental

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

- O6.0CA101C09.1. Understand the concept of matrices and various operations performed on matrices
- O6.0CA101C09.2. Learn basic concepts of probability
- O6.0CA101C09.3. Use different types of functions
- O6.0CA101C09.4. Develop the concept of Set, Relations and Function
- O6.0CA101C09.5. 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 binominal 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 multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (lxv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (lxvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

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
O6.0CA101C09.1	1		1	2	2		3						3	1
O6.0CA101C09.2	1	1	2	3	1		2						3	1
O6.0CA101C09.3	1	2	2	1	2								2	1
O6.0CA101C09.4	1	1	2	1	1		3						1	2
O6.0CA101C09.5	1	1	2	1			2	3					2	2

MRIPRS

SEMESTER - II

006.0CA219C05: Research and Innovation Catalyst-II

Periods/week Credits
T: 1 0.5

Max. Marks 100
Continuous Evaluation 100

Pre-requisites: Research and Innovation Catalyst-I

Course Type: SEC

Course Outcomes: The students will be able

- OO6.0CA219C05.1. To critically evaluate the work done by various researchers relevant to the research topic
- OO6.0CA219C05.2. To integrate the relevant theory and practices followed in a logical way and draw appropriate Conclusions
- OO6.0CA219C05.3. To understand the research methodologies/approaches/techniques used in research/ Innovation domains
- OO6.0CA219C05.4. To structure and organize the collected information or findings through an appropriate abstract, headings, reference citations and smooth transitions between sections
- OO6.0CA219C05.5. To learn the structuring of the paper/ concept in the form of Power Point Presentation
- OO6.0CA219C05.6. To adapt working with group members and outside world.

Unit 1: Literature Survey (LS)

Collection of research papers related to previously identified gap/problem
Comprehend and arrange the literature based on the idea framed
Presenting the collected data and inferring it with the further scope of expansion

Unit 2: Structuring of Review Paper

Analysis of different approach/methodology adopted by various researchers
Listing out the components of the paper w.r.t the problem
Identification of suitable Journal or Conference
Formatting/Styling the paper according to the respective template

Unit 3: Presenting the findings

Structuring and preparation of PPT
Mock presentation
Review on presentation skills and content delivered both
Incorporating the review comments in the slides

References:

<http://www.sciencedirect.com/>
<https://www.ncbi.nlm.nih.gov/pubmed>
<https://www.elsevier.com/books-and-journals>
<https://www.plos.org/>
<https://www.deepdyve.com/>
<http://ieeexplore.ieee.org/Xplore/home.jsp>
<https://www.researchgate.net/>
<https://www.science.gov/>
<https://scholar.google.co.in/>
<http://www.popsci.com/>

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
Literature Survey	<ul style="list-style-type: none"> Usage of Scientific Literature Databases. e.g., Scopus/ Web of Science/ etc. Number of relevant papers referred for the given topic Summarizing the referred paper Plagiarism/Authenticity Reference listing 	2 4 4 3 2	15
Structuring and presentation	<ul style="list-style-type: none"> Paper structuring and presentation Group presentation with individual contribution Target journal, Impact factor/ Topic centered Journal Students response towards comments by research/faculty mentors 	7 2 1 5	15

Course Articulation Matrix:

CO Statement (XX-400)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
OO6.0CA219C0 5.1	√	√		√									√	√	√	√
OO6.0CA219C0 5.2	√			√		√				√			√	√	√	√
OO6.0CA219C0 5.3	√			√		√				√			√	√	√	√
OO6.0CA219C0 5.4		√		√		√		√		√			√	√	√	√
OO6.0CA219C0 5.5																
OO6.0CA219C0 5.6																

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA220C01: DATA COMMUNICATIONS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Computer Networks

Course Type: Core

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

- OO6.0CA220C01.1. Understand the principles of data communication and transmission.
- OO6.0CA220C01.2. Define signals and explore their characteristics.
- OO6.0CA220C01.3. Grasp the concepts related to transmission media.
- CA220C01.4. Apply hardware and software solutions to enhance network efficiency
- OO6.0CA220C01.5. Analyze network security needs, potential errors, and methods for error control.

UNIT 1: Basic Concepts of Data Communication

Introduction to data communication
Components of data communication
Advantages and applications of Networking
Network Topologies
Network Protocols
Connection –oriented and Connection-less Services
Modes of data transmission

UNIT 2: Signals and Transmission Media

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

UNIT 3: System Architecture and Layered Protocol Models

Protocol hierarchies
Layered Architecture
ISO OSI Reference Model
TCP/IP Model

UNIT 4: Data link Layer

Functions of Data Link Layer
Framing of data
Flow Control
Error control

High Level Data Link Control (HDLC)
Error detection Techniques (VRC,LRC, CRC, Checksum)
Error Correction Techniques (Single Bit Error Correction, Hamming Code and Burst Error Correction)

MRIR

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)

UNIT 5: Transport Layer

Functions of Transport Layer

TCP and UDP

Routing Algorithms (Static Routing Algorithms: Shortest Path Routing, Dynamic Routing: Distance Vector Routing, Link State Routing)

Congestion control (Congestion Avoidance, Discarding and Leaky Bucket Algorithm)

Fault handling

Access control

UNIT 6: IEEE Standards, Protocols & Addressing

Logical link Control (LLC)

IEEE Standard 802.3(Ethernet)

IEEE Standard 802.4 (Token Bus)

IEEE Standard 802.5 (Token Ring)

X.25

Frame Relay

Asynchronous Transfer Mode (ATM)

IPv4 & IPv6

Suggested Readings:

B. Forouzan, 2001, Data Communication and Networking, Tata McGraw Hill.

A.S. Tanenbaum, 1994, Computer networks, Prentice Hall.

Tomasi Wayne, 2004, Introduction to Data Communication & Networking, Pearson Education

Uyless Black, 1994, Computer networks: Protocol Standards and Interfaces, Prentice Hall Education

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 multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(Ixvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(Ixviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA220C01.1		2	3		2	1	1					1		3
OO6.0CA220C01.2		2	2				1						2	3
OO6.0CA220C01.3		2	2	2			1						3	2
OO6.0CA220C01.4	2						2						2	2
OO6.0CA220C01.5		1	2		2		1						2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA221C01: ANALYSIS & DESIGN OF ALGORITHM

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Data Structures

Course Type: Core

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

OO6.0CA221C01.1. Learn the basics of various computer algorithms.

OO6.0CA221C01.2. Understand the algorithm in terms of time and space complexity and to apply Divide & Conquer approach.

OO6.0CA221C01.3. Apply Greedy method to solve critical problems.

OO6.0CA221C01.4. Analyze algorithms for finding optimal solution using Dynamic Programming methods.

OO6.0CA221C01.5. Evaluate programming problems using the Backtracking method.

CA221C01.6. Design the deterministic and non-deterministic polynomial time algorithms.

UNIT 1: Introduction to Algorithm

Algorithm analysis
Problem solving approach
Asymptotic analysis
Analysis of Non-recursive and Recursive Algorithm
Sets and disjoint sets union

UNIT 2: Divide and Conquer approach

Introduction to Divide and Conquer approach
Binary search
Merge sort
Quick sort
Selection sort
Stassen's matrix multiplication algorithms

UNIT 3: Greedy Method

Introduction to Greedy Method
Knapsack problem
Job sequencing with deadlines
Minimum Spanning Trees: Kruskal and Prim's method
Single source shortest paths (Dijesktra's algorithm).

UNIT 4: Dynamic Programming

General method
Optimal binary search trees
0/1 knapsack
Traveling salesperson problem

UNIT 5: Backtracking

General Method
queen's problem
Graph colouring
Hamiltonian cycles
Introduction to Branch and Bound approach
0/1 knapsack
Traveling salesperson problem.

UNIT 6: Problem Classes

Polynomial and Non Polynomial classes
NP-hard and NP-complete
Deterministic and non-deterministic polynomial time algorithms,
Cook's theorem
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/
(Last Visited Date: 22nd February, 2024)
(<https://www.youtube.com/watch?v=1PI58Q3Ne2w> (Last Visited Date: 22nd February, 2024))

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

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For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(Ixx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX

CO-PO Statement	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
OO6.0CA221C01.1	3	3	3	3	1		3				2	3	3	3
OO6.0CA221C01.2	3	3	3	2	2		2				2	3	3	3
OO6.0CA221C01.3	3	3	3	3	3		3				2	3	3	3
OO6.0CA221C01.4	3	3	3	2	1		2				2	3	3	3
OO6.0CA221C01.5	3	3	3	3	3		3	2			2	3	3	3
OO6.0CA221C01.6	1	2	1	2	1		2				2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA222C01: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Basics of Data Structure

Course Type: Core

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

- OO6.0CA222C01.1. Understand the fundamental concepts of Artificial Intelligence.
- OO6.0CA222C01.2. Interpret the problem as a state space, graph, design heuristics and select amongst different search or game-based techniques to solve them.
- OO6.0CA222C01.3. Apply knowledge representation, reasoning, and machine learning techniques to real-world problems
- OO6.0CA222C01.4. Examine various AI search algorithms
- CA222C01.5. Assess critically the Artificial Intelligence techniques presented and apply them to real world problems

Unit 1: Introduction to Artificial Intelligence

Foundations, scope, problems, characteristics, examples and approaches of AI
Application Areas of Artificial Intelligence
Problem solving in Artificial Intelligence: Tic-Tac-Toe, Water Jug problem
Current trends in Intelligent Systems
AI application to robotics
Goal driven Learning agents
Programming Languages of Artificial Intelligence

Unit 2: Problem Solving Concepts and AI Search Techniques

Problem Solving Concepts and Methods
Types of Search techniques: Uninformed (Blind) and Informed (Informed) techniques
Blind search techniques: Breadth-First search and Depth- First search methods
Heuristic search techniques
Best First search, Means-ends Analysis Technique
Problem reduction, Constraint satisfaction

Unit 3: Knowledge Representation

Foundations of knowledge representation and reasoning
Propositional and Predicate logic
Syntax and Semantics for first order logic
Resolution and Unification
Knowledge representation schemes: semantic nets, frames.

Unit 4: Reasoning and Game Playing

Reasoning about Knowledge, Default Reasoning
Reasoning with uncertain knowledge
Probability Based Reasoning
Reasoning Using Certainty Factors; Bayes Theorem

Fuzzy Based Reasoning Systems
Games playing: Minimax algorithm, Tic-Tac-Toe

Unit 5: Expert Systems & Natural Language Processing

Expert system: Definition and applications
Characteristics of expert system
Basic components & architecture of expert systems
Introduction to Natural Language Processing (NLP)
Parsing techniques

Unit 6: Machine Learning and Neural Networks

Introduction to Machine Learning
Learning techniques
Applications of Machine Learning
Introduction to Neural Network
Artificial and Biological Neurons
Classifications of Neural Network

Suggested Readings:

Pradhan Manaswini, 2023, Fundamentals of Artificial Intelligence and Machine Learning: DPS Publishing House
Russel and Norwig, 2022, Artificial Intelligence: A Modern Approach, Pearson Education.
George F. Luger, 2022, Artificial Intelligence, Pearson Education.

Note: Only latest editions of the books are

Recommended. Web links:

http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf (Last visited date: 22.2.24)
https://epub.uni-regensburg.de/13629/1/ubr06078_ocr.pdf (Last visited date: 22.2.24)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(Ixxi) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(Ixxii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO 3	PO4	PO5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
OO6.0CA222C0 1.1	2	2	2	2		2							1	1
OO6.0CA222C0 1.2	1	3	1	3		2								1
OO6.0CA222C0 1.3	3	2		2		1							2	2
OO6.0CA222C0 1.4	1		2			3							2	
OO6.0CA222C0 1.5	3	3		2		3							3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA200C06: VOCATIONAL TRAINING

Periods/week Credits
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
OO6.0CA200C06.1 Describe the Systems Development Life Cycle (SDLC).
OO6.0CA200C06.2 Construct and evaluate data flow diagrams.
OO6.0CA200C06.3 Design and evaluate system outputs
OO6.0CA200C06.4 Construct and evaluate entity-relationship (ER) diagrams for real projects
OO6.0CA200C06.5 Determine the various test cases and analyze the results.
OO6.0CA200C06.6 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:

Presentation	-	30 marks
Viva-		50 marks
Thesis/Project report	-	20 marks.

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA276C01: R PROGRAMMING LAB

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

Max. Marks : 100
Continuous Evaluation: 30
End Semester Examination : 70

Co-Requisite: Basics of Linear Algebra and Programming in C language

Course Type: Core

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

- OO6.0CA276C01.1. Understand how to setup R environment and R Console.
- OO6.0CA276C01.2. Demonstrate different data structures (vectors, lists, matrices, data frames) in R.
- OO6.0CA276C01.3. Analyze the various data sets in R programming (importing and exporting of data).
- OO6.0CA276C01.4. Assess the data manipulation technique using R programming
- OO6.0CA276C01.5. Develop an application in R using a built-in database..

List of Experiments:-

Activity 1: Concept: Overview of R Console, R script, R Environment and Graphical Output.

Installation and Environmental setup in R studio.
Introduction to data types and scripts of R.

Activity 2: Introduction to Arrays & Vectors

Implement recursive functions using R tool.

Create and modify matrix using c function (c()) in R tool.

Create a list using List() and perform List Slicing operation in R tool.

Create three vectors X,Y,Z with integers and each vector has 3 elements. Combine the three vectors to become a 3×3 matrix A where each column represents a vector. Change the row names to a,b,c.

Create a vector with 12 integers. Convert the vector to a 4*3 matrix B using matrix(). Please change the column names to X, Y, Z and row names to a, b, c, d.

Create the vector of for (1.2.3,...19.20,19,18,...2,1)

Create a vector of values of
 $e^{\cos(x)}$ at $x= 3,3.1,3.2,\dots,6$;

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

Create a data frame in R and perform various operations.

Implement Linear Model Formula using 100 variables in R.

Write a program to expand data frame in R.

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)

Generate Exploratory Analysis of Big Mart Data Set.

Generate Exploratory Analysis of Train Data Set.

Show graphical representation of Big Mart Data set using Univariate Analysis and Bivariate Analysis.

Show graphical representation of Train Data Set using Univariate Analysis and Bivariate Analysis.

Activity 5: Data Manipulation in R.

Calculate the count of Outlet Identifiers,Item Identifiers and Outlet years of Big mart Data Set.

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.

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:

CO-PO Statement	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
OO6.0CA276C01.1	1	1	1	1	2								3	3
OO6.0CA276C01.2	2	2	1	1	2								3	3
OO6.0CA276C01.3	3	3	2	2	2								3	3
OO6.0CA276C01.4	3	2	2	3	2								3	3
OO6.0CA276C01.5	1	2	3	3	2						2		3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA277C01: ANDROID APPLICATION DEVELOPMENT LAB

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Co-Requisite: Knowledge of Java.

Course Type: Core

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

- OO6.0CA277C01.1 Describe the application lifecycle, intents, and activities.
- OO6.0CA277C01.2 Create mobile applications on the Android Platform.
- OO6.0CA277C01.3 Create mobile applications involving data storage in SQLite Database.
- OO6.0CA277C01.4 Deploy and maintain the Android Application.
- OO6.0CA277C01.5 Students should be able to debug and test Android apps using Android Studio's built-in tools and techniques.

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

Linear Layout
Relative Layout and
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:

Create a user registration application that stores the user details in a database table.
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:

- Create an accident alert app.
- Create a diet planner app
- Create an application for budget management of your family.
- Create an application to stimulate calculator
- Create an application to simulate Notepad
- Create an application for Women Protection System

Note: Faculty can suggest more practical assignment and projects as per the need.

Suggested Readings:

- Reto Meier, 2010, Professional Android Application Development 2.
- Marko Gargenta, 2014, Learning Android
- 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/> (Last Visited Date: 23rd February, 2024)
- <https://www.javatpoint.com/android-tutorial> (Last Visited Date: 23rd February, 2024)
- <https://hackr.io/tutorials/learn-android-development> (Last Visited Date: 23rd February, 2024)

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:

CO-PO 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	PSO 1	PSO2
OO6.0CA277C01.1	2	3	2		3								2	3
OO6.0CA277C01.2	2	3			3									
OO6.0CA277C01.3	1	3	2		3									
OO6.0CA277C01.4	2	3	2	2	3		1	1	1		1	2	2	3
OO6.0CA277C01.5	1		2	2	2			1				2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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006.0CDC296C05: Placement Competency Enhancement-II

Periods/week Credits
L: 0 P:6 1
Duration of Examination: 3 Hrs

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Mode of End-Term Examination: Online + Practical

Pre-requisite: Placement Competency Enhancement-I
Course Type: SEC

Course Outcomes: The students will be able to:

- OO6.0CDC296C05.1: Develop verbal competence to function effectively at the workplace.
- OO6.0CDC296C05.2: Enhance their placement prospects and manage interviews effectively.
- OO6.0CDC296C05.3: Interpret data and hone their logical reasoning skills
- OO6.0CDC296C05.4: Solve complex problems based on time, work, Permutation, and probability.
- OO6.0CDC296C05.5: Analyze code complexity through asymptotic analysis, understanding time and space complexity, and evaluating the order of growth, best, average, and worst cases of algorithms.
- CDC296C05.6: Apply data structure concepts, including linked lists, stacks, queues, trees, BSTs, and hashing, and try to solve programming problems, demonstrating proficiency in implementation and manipulation.

Part - A (VERBAL ABILITY)

Unit 1: Word Order and Sentence Construction

- One Word Substitution
- Ordering of Words
- Sentence Improvement, ordering of sentences
- Spotting Errors
- Change of Voice/ Direct & Indirect speech

Unit 2: Reading Comprehension

- Strategic Reading, Eliminating Poor Reading Habits
- Techniques to increase speed reading, comprehension and recall
- Solving Sample RC Passages
- Cloze Test
- Para Jumbles

PART – B (INTERVIEW ENHANCEMENT)

Unit 3: Professional Competencies

- Showcasing Professional Attitude in an Interview
- Business Etiquettes
- 3.3 Social Media, Digital Ethics, and Cyber Security -
- Design Thinking
- Entrepreneurship skills
- Managing Personal Finance

Unit 4: Interviews Preparation- II

- Body Language in interviews

MRIRRS

PART – C (APTITUDE)

Unit 5: Arithmetic -II

Average
Time & Work
Mixture & Allegation
Data Interpretation

Unit 6: Advanced Aptitude

Permutation & Combination
Probability
Syllogism
Data Sufficiency

PART – D (Technical)

Unit 7: Code Complexity, Libraries

Asymptotic Analysis, Time and Space Complexity
Order of Growth, Best, Average and Worst cases of various algorithms
STL/ HashSet, HashMap, ArrayList

Unit 8: LinkedList

Introduction to LL, traversal, insert-deletion of node, Singly, Doubly and Circular Linked List

Unit 9: Stack, Queue

Stack - Introduction and Operations, array and LL Implementation of Stack
Queue - Introduction and operations, array and LL Implementation of Queue

Unit 10: Tree, BST

Introduction to Binary Tree, Traversal (In, Pre, Post & Level order), Tree height, problems: Burn a Binary tree from a leaf, Serialize and Deserialize a Binary Tree, etc.
10.2. BST – Introduction, Search, Insert and Delete operations

Unit 11: Hashing & Tries

Basic hashing and hashing operations
Multiple nodes in Tries, create, insert, search, and remove operation

Recommended Texts and Readings:

Aggarwal, R. S. (2018). Quantitative aptitude for competitive exams (7th ed.). S. Chand & Company Pvt. Ltd.
Sharma, A. (2014). How to prepare for logical reasoning for CAT (4th ed.). Tata McGraw Hill Education.
Lewis, N. (2015). Word power made easy (1st ed.). Penguin Random House Pvt. Ltd.
Andrews, S. How to ace your job interview.
Dessler, G., & Varkkey, B. (2020). Human resource management (15th ed.). Pearson Education India.
Karumanchi, N. (2016). Data structures and algorithms made easy (5th ed.). CareerMonk Publications.
<https://www.investopedia.com/articles/personal-finance/080615/5-skills-every-entrepreneur-needs.asp>
(Last accessed - May 15, 2024)

Assessment Tools:

Continuous Assessment: Assignments/ Activities/ Quiz
Sessional examination (Online mode) at 2nd sessional
Term-end examination (Practical + Online mode)

Internal Marks Distribution:

MRIRRS

Sessional examination at the time of 2nd sessional	30 marks
Continuous assessment	15 marks
Attendance	5 marks

Course Articulation Matrix:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CDC296C05.1	-	-	-	-	-	3	-	-	-	-	-	2	1	-
OO6.0CDC296C05.2	-	-	-	-	-	3	3	-	-	-	-	1	2	-
OO6.0CDC296C05.3	-	-	3	-	-	-	-	-	-	-	2	-	-	-
OO6.0CDC296C05.4	-	-	3	-	-	-	-	-	-	-	-	1	-	1
OO6.0CDC296C05.5	3	-	-	-	-	-	-	-	-	-	-	1	2	-
OO6.0CDC296C05.6	-	-	-	-	3	-	-	-	-	-	-	2	2	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA200E02: COMPUTER GRAPHICS

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

Max. Marks 100
Continuous Evaluation 30
End Semester Examination : 70

Pre-requisite: None

Course Type: Domain Elective

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

OO6.0CA200E02.1: Describe the basic concepts of computer graphics and its applications in day to day life.

OO6.0CA200E02.2: Summarize and interpret the various categories of graphics algorithms.

OO6.0CA200E02.3: Apply various scan conversion algorithms on real life problems.

OO6.0CA200E02.4: Apply effective editing by using different transformations on 2D and 3D objects.

OO6.0CA200E02.5: Categorize the different object shapes and their detection methods in 2D and 3D viewing.

OO6.0CA200E02.6: Demonstrate practical applications on computer graphics to continue professional development.

UNIT 1: Introduction to Computer Graphics

Basic concepts of Computer Graphics

Computer graphics hardware, Software and Standards

User Interface: Console User Interface (CUI) and Graphical User Interface (GUI)

Application of Computer Graphics

Input – Output Devices

Cathode Ray Tube

Color Monitors

Flat Panel Devices

Direct View Storage Tube

Frame Buffer

Display Processor

UNIT 2: Scan Conversion

Scan Conversion of Point, Line, and Circle

Line Drawing Algorithm: Slope Intercept, DDA and Bresenham's

Circle Drawing Algorithm s: Mid Point, Bresenham's

Ellipse Drawing Algorithm

Antialiasing

UNIT 3: Curve drawing and Polygon filling Algorithms

Introduction to Curve Hierarchy

Bezier Curve

B-spline Curve

Area Fill Attributes: Fill style, Pattern Fill, Soft fills

Solid Modelling Techniques: Sweep Representation, Constructive Solid Geometry, Octtree, BSP Tree

Filling of Curved Boundary: Boundary fill algorithm, Flood fill algorithm.

Character Generation

UNIT 4: Transformation & Projection

Two Dimensional and Three-Dimensional graphics concepts

Introduction to basic Matrix Operation

2-D transformation: Translation; Scaling; Rotation; Reflection, Shearing.

Composite transformations

3-D Transformation: Translation; Scaling; Rotation.

MRPDRS

Numerical Implementation of 2D and 3D Transformation
Introduction to Projection
Types of projections : Parallel & Perspective

UNIT 5: Clipping

Introduction to Window and Viewport
Viewing pipeline
Viewing Coordinate Reference Frame
Window to Viewport mapping
Introduction to Clipping
Point Clipping Algorithm
Line Clipping Algorithms: Cohen Sutherland, Liang Barsky
Polygon Clipping Algorithm: Sutherland-Hodgeman, Weiler Antherton

UNIT 6: Visible Surface Detection Methods

Concept of Hidden Line & Surfaces
Classification of Visible Surface Detection Algorithm
Back Face Detection
Depth Buffer Method
Depth Sorting Method
Wireframe Methods
Visibility Detection Functions

Suggested Readings:

D Hearn & P M Baker, 2002, Computer Graphics, Prentice Hall
J D Foley & A Van Dam, 1983, Fundamentals of interactive Computer Graphics, Addison Wesley
Schaum Series, 2004, Computer Graphics, Tata McGraw Hill
Pradeep K. Bhatia, 2013, Computer Graphics, I.K. International

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.javatpoint.com/computer-graphics-tutorial> (last visited date: 23 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(Ixxiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(Ixxiv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials
Sessional tests

Surprise questions during lectures/Class Performance
Term end examination

MRIPS

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA200E02.1		2				1	2	1	1	1	1		2	2
OO6.0CA200E02.2	2		1			1	2	1	1	1	2		1	1
OO6.0CA200E02.3	2		1			1	2	1	1	1	2		1	3
OO6.0CA200E02.4	2		1			1	2	1	1	1	2		1	3
OO6.0CA200E02.5	2	2		2	2	1	2	2	2	1	2		2	2
OO6.0CA200E02.6	2					1	1	1	1	1	1	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA201E02: WEB APPLICATIONS DEVELOPMENT USING PHP

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Programming Languages and Database Management System

Course Type: Domain Elective

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

OO6.0CA201E02.1. Learn basics of Web Programming.

OO6.0CA201E02 2. Understand the concepts of different frameworks for website designing.

OO6.0CA201E02.3. Apply different tools and run commands for developing interactive

website. OO6.0CA201E02.4. Analyze the interface and make connectivity with database.

CA201E02.5. Create and design website using PHP and MySql.

UNIT 1: HTML Basics

Principals involved in developing website

Five golden rules of web designing

Web Standards

Introduction to HTML

Basic Structure of HTML document

HTML Tags

Content layout and presentation

Working with images

Working with Lists

Table Handling

Frame Design

Form Design

UNIT 2: Introduction to Cascading Style Sheets and JavaScript

Introduction to Cascading Style Sheet

CSS Properties

Internal Style sheets

External Style sheets

Inline Style sheets

CSS ID and Class

Introduction to JavaScript: Document Object Model

JavaScript identifiers

JavaScript Operators

Control & Looping structure

Creating Dialog Boxes

Unit 3: Hypertext Preprocessor (PHP) Concepts

Introduction to PHP

PHP history and importance

Variables and Constants in PHP

Data types in PHP

Operators in PHP

Conditional statements

Loops

Date and Time and Image uploading in PHP
Creating and accessing string
String functions
Working with PHP forms: Get and Post methods
Form Validation
Session Handling

UNIT 4: Working with Arrays and Files

Concept of Arrays
Types of Arrays: Index based arrays and Associative Arrays
Accessing Arrays
Single dimensional Arrays
Multidimensional array
Opening and Closing of File
Introduction to Objects
Copying, renaming and deleting of file
Working with directories
Building text editor
File uploading and downloading

UNIT 5: Object Oriented Programming in PHP

Declaring a class
The new keyword and constructor
Destructor
Access method and properties using \$this variable
Public, private, protected properties and methods
Inheritance
Polymorphism
Exception Handling: Understanding Exception and error
Try, catch, and throw

UNIT 6: Connection with MySQL Database and Introduction to Frameworks

Introduction to MySQL
Performing basic database operation (DML): Insert, Delete, Update, Select from PHP Scripts
Executing parameterized query
Joins: Cross joins, Inner joins, Outer Joins, Self joins
Storing and retrieving data from MySQL DB using PHP based forms
Sending Email using PHP form
Introduction to Frameworks (Word Press)

Suggested Readings:

Ivan Bayross, 2010, HTML, DHTML, PERL, CGI, BPB Publications.
Mike McGrath, 2012, PHP and MySQL, Tata McGraw Hill
Lynn Beighley, 2008, Head First PHP & MySQL, O'Reilly Media
W.Jason Gilmore, 2010, Beginning PHP and MySQL from Novice to Professional, Apress.
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/> (last visited date: 22 February 2024)

<https://www.javatpoint.com/php-tutorial> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(lxxv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(lxxvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA201E02.1	3	2	1			2							2	2
OO6.0CA201E02.2		1		1			1	1	1	2			1	1
OO6.0CA201E02.3		3							1				1	3
OO6.0CA201E02.4		3						1					1	3
OO6.0CA201E02.5		3	3	2	2	1	1	1		1			2	3

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OO6.0CA202E02: CLOUD COMPUTING PLATFORMS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Cloud

Course Type: Domain Elective

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

- OO6.0CA202E02.1 Understand the core concepts of cloud computing.
- CA202E02.2 Evaluate and differentiate between major cloud computing platforms.
- OO6.0CA202E02.3 Deploy, manage, and optimize resources on various cloud platforms.
- OO6.0CA202E02.4 Develop cloud-native applications tailored to specific cloud services.
- OO6.0CA202E02.5 Analyze real-world use cases and business scenarios for selecting cloud platforms.

Unit 1: Introduction to Cloud Computing Platforms

Defining Cloud Platforms
Features and Benefits of Cloud Platforms
Types of Cloud Computing Platforms
Brief Introduction of popular Cloud Computing Platforms

Unit 2: Amazon Web Services (AWS)

Overview of AWS Services and Core Infrastructure.
EC2: Virtual Servers in the Cloud.
S3: Scalable Storage in the Cloud.
RDS: Managed Relational Databases.
Lambda: Serverless Computing.
Deployment and Best Practices on AWS.

Unit 3: Microsoft Azure

Azure Core Services and Resource Management.
Azure Virtual Machines.
Azure Storage (Blob, Table, Queue)
Azure Networking (Virtual Network, ExpressRoute)
Azure SQL Database.
Azure Functions.
Azure Deployment and Governance.

Unit 4: Google Cloud Platform (GCP)

Introduction to GCP Services and Resources.
Compute Engine and Kubernetes Engine
GCP storage (Cloud Storage, Bigtable)
Networking in GCP (VPC, Load Balancing)
GCP databases (Cloud SQL, Firestore)
Google Cloud security and compliance
Managing Resources on GCP.

Unit 5: Other Cloud Platforms

MRIRRS

Oracle Cloud: Offerings and Use Cases.
Alibaba Cloud: Core Services and Solutions.
Hybrid and Multi-Cloud Strategies.
Comparative Analysis of Different Cloud Platforms.

Unit 6: Cloud-Native Application Development

Building Cloud-Native Applications.
Containerization and Orchestration (Docker and Kubernetes).
DevOps and Continuous Integration/Continuous Deployment (CI/CD).
Serverless Computing and Microservices.
Case Studies and Real-World Cloud Platform Selection Scenarios.

Suggested Readings:

Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, 2013, "Mastering cloud computing", Tata McGraw Hill Education Private Limited.
Anthony T.Velte, Toby J. Velte, Robert Eisenpeter, 2010, "Cloud Computing a Practical Approach", Tata McGraw-HILL.
James Loope, 2011, "Managing Infrastructure with puppet", O'REILLY.

Note: Only latest editions of the books are recommended.

Web Links:

<https://cloud.google.com/appengine/docs> (last visited date: 22 February 2024)
<https://www.chef.io/solutions/cloud-management> (last visited date: 22 February 2024)
<https://aws.amazon.com/documentation> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(Ixxvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(Ixxviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

Course Articulation Matrix:

CO-PO Statement	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS 01	PS 02
OO6.0CA202E02.1	1	2	3	3	1		3				2	2	2	1
OO6.0CA202E02.2	2	2	3	2	3		2	2			3	3	3	1
OO6.0CA202E02.3	2	3	3	3	3		3	2	2		2	3	3	2
OO6.0CA202E02.4	3	3	3	2	1		2		2		1	3	1	3
OO6.0CA202E02.5	2	3	3	3	3		3	2			1	3	2	2

MRIR

OO6.0CA203E02: PROGRAMMING WITH AWS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: None
Course Type: Domain Elective

Course Outcomes: Students will be able to –

OO6.0CA203E02.1 Design the overall networking environment for servers.
OO6.0CA203E02.2 Deploy, Manage and Scale applications using container orchestration service. OO6.0CA203E02.3 Monitor Server Resources and Account activities.
CA203E02.4 Setup Database Engines and Secure Servers and Services.

UNIT 1: Fundamentals of AWS Cloud Computing

Introduction to AWS
AWS Global Infrastructure
AWS Services
AWS Ecosystem
AWS Marketplace

UNIT 2: Elastic Compute Cloud

Launching our first EC2 instance
EC2 instance types & Pricing Models
Creating AMI and Image Templates
Understanding Security Groups - a Server-side Firewall

UNIT 3: Virtual Private Cloud

Introduction to Network Switches & Virtual Private Cloud
VPC & Subnets
Private and Public Subnets
Internet Gateways, VPC Peering & NAT Gateways
VPN Setup

UNIT 4: Storage

Introduction to Block & Object storage mechanism
Introduction to Elastic Block Store – EBS
EBS Snapshots
Introduction to Simple Storage Service (S3)
Features of S3

UNIT 5: Elastic Load Balancers and Elasticity

Understanding High Availability Configuration
ELB Configuration with Classic and Application Load Balancers
Auto Scaling

MDRIPS

Getting Started with Containerization
 ECS Services and Tasks
 Load Balancing in ECS
 ECS Scaling

Suggested Books:

John Culkin, 2021, AWS Cookbook, O'Reilly media
 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> (Last visited Date: 21st February 2024)
<https://www.javatpoint.com/aws-tutorial> (Last visited Date: 21st February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(lxxx) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(lxxx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

Course Articulation Matrix:

CO-PO Statement	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
OO6.0CA203E02.1	1	1	1	1	1		3				2		2	1
OO6.0CA203E02.2	3	2	2	2	3		2	3				3		1
OO6.0CA203E02.3	2	1	2	3	3		3	3	2				3	
OO6.0CA203E02.4	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)

OO6.0CA204E02: SUPERVISED LEARNING

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Pre-Requisite: Basic Knowledge of Data Mining

Course Type: Domain Elective

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

Course Outcomes: Students will be able to –

OO6.0CA204E02.1 Understand how to select an appropriate supervised machine learning method for a given scenario and dataset.

OO6.0CA204E02.2 Understand the trade-offs inherent in different machine learning methods: speed, accuracy, complexity of hypothesis space, etc.

CA204E02.3. Increase awareness of issues of algorithmic bias, transparency, fairness in supervised machine learning applications.

UNIT 1: Introduction to Supervised Learning

Introduction to Supervised learning
Supervised learning algorithms
Training and tuning in supervised learning
Model evaluation in supervised learning
Applications of Supervised learning

UNIT 2: Linear Regression

Regression basics: Relationship between attributes using Covariance and Correlation
Relationship between multiple variables: Regression (Linear, Multivariate) in prediction.
Residual Analysis
Identifying significant features, feature reduction using AIC, multi-collinearity
Hypothesis testing of Regression Model

UNIT 3: Multiple Linear Regression

Polynomial Regression
Regularization methods
Lasso, Ridge and Elastic nets
Categorical Variables in Regression

UNIT 4: Non-Linear Regression

Logit function and interpretation
Types of error measures (ROCR)
Logistic Regression in classification

UNIT 5: Classification

Basic Concepts
Decision Tree Induction
Bayes Classification Methods
Introducing Ensemble methods
Support Vector Machine

UNIT 6: Clustering

Distance measures
Different clustering methods (Distance, Density, Hierarchical)
Iterative distance-based clustering;
Dealing with continuous, categorical values in K-Means
Constructing a hierarchical cluster

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.w3schools.com/datascience/> (Last visited date: 22 February 2024)
<https://www.javatpoint.com/data-science> (Last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

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(lxxxi) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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(lxxxii) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA204E02.1	2	2		3	2		2					1	2	3
OO6.0CA204E02.2	2	2	3	1	2		1						3	2
OO6.0CA204E02.3	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)

OO6.0CA205E02: TEXT MINING

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

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:

- OO6.0CA205E02.1. Understand basic concepts and theories of text mining and utilize computational tools and methods for text mining
- OO6.0CA205E02.2. Learn the fundamentals of natural language processing & tools
- OO6.0CA205E02.3. Classify text and design associated algorithms
- CA205E02.4. Understand the concept text clustering & text modelling
- OO6.0CA205E02.5. Know the concepts of social media & network analysis
- OO6.0CA205E02.6. Analyze sentiments problems and emotions detection approaches

Unit 1: Natural language processing

Foundations of natural language processing
Language syntax and structure
Text pre-processing and Wrangling,
Stemming, Lemmetization
Removing stop words.
Future engineering for text representation

Unit 2: Text classification

The Vector Space Model and tf-idf weighting, representing unstructured text documents with appropriate format
Feature selection and text categorization algorithms
Naive Bayes, k-Nearest Neighbor (kNN),
Logistic Regression,
Support Vector Machines and Decision Trees.
Evaluation of text classification: precision and recall, confusion matrix, F-score

Unit 3: Text clustering & Topic Modelling

Clustering algorithms,
Connectivity-based clustering (hierarchical clustering)
Centroid-based clustering (k-means clustering)
Evaluation of text clustering: purity and Rand index
Concept of topic modelling
Topic models—Probabilistic Latent Semantic Indexing (pLSI) and Latent Dirichlet Allocation (LDA)
Document summarization

Unit 4: Social-Media and Network analysis

Characteristic of social network, inter-connectivity
Google's winning algorithm PageRank
social influence analysis and social media analysis

Unit 5: Sentiment analysis

Definition of the sentiment analysis problem

Differences between sentiment analysis and emotion detection
sentiment polarity prediction, mining and aspect identification
Lexicon-based approaches to sentiment analysis
Key approaches to exploit dictionaries, ontologies,
specialized corpora for detecting the sentiment polarity in texts
Machine learning approaches to sentiment analysis
Overview of neural network architectures for sentiment analysis

Unit 6: Affect and emotion detection

Survey and definition of affect and emotion detection in texts
Differences between the tasks of detection of sentiment, feelings, emotions, and opinion
Modelling language of emotions using neural networks and statistical language model
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:

Charu C. Aggarwal and Cheng Xiang Zhai, 2012, "Mining Text Data", Springer
Dan Jurafsky and James H Martin, 2000, "Speech & Language Processing", Pearson Education India
Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, 2007, "Introduction to Information Retrieval", Cambridge University Press
Liu, B., 2012, Sentiment analysis and opinion mining. Synthesis lectures on human language technologies, 5(1), 1-167.
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
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:

<https://www.educba.com/text-mining/> (Last visited Date: 22/2/2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(lxxxiii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(lxxxiv) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

MRIPRS

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA205E02.1		1	3	1	1		1					1	2	2
OO6.0CA205E02.2	2		2	2	1		1						3	2
OO6.0CA205E02.3	2	1	1	1	2		3					1	2	2
OO6.0CA205E02.4		2	2	3	1		2						2	2
OO6.0CA205E02.5	2		3	2			2	3				3	2	3
OO6.0CA205E02.6	1	1	1	1	1		2	2				2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA206E02: CRYPTOGRAPHIC

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

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:

O6.0CA206E02.1 Understand basic cryptographic algorithms, message and web authentication and security issues.

O6.0CA206E02.2 Identify information system requirements for both of them such as client and server.

O6.0CA206E02.3 Understand the current legal issues towards information security.

CA206E02.4 Understand the authentication process and algorithm towards information security.

O6.0CA206E02.5 Understand the security algorithm towards information security.

UNIT 1: Introduction:

Security Attacks
Security Services
Integrity check
1.5 Digital Signature
1.5 Authentication

Unit 2: Secret Key Cryptography:

Block Encryption
DES rounds
S-Boxes IDEA
Uses of Secret key Cryptography
ECB, CBC, OFB, CFB
Multiple encryptions DES

Unit 3: Hash Functions and Message Digests

Length of hash, uses
Algorithms (MD2, MD4, MD5, SHS)
MD2: Algorithm (Padding, checksum, passes.)
MD4 and 5: algorithm (padding, stages, digest computation.)
SHS: Overview, padding, stages

Unit 4: Public key Cryptography:

Algorithms
Modular arithmetic (addition, multiplication, inverse, and exponentiation)
RSA: generating keys, encryption and decryption
PKCS
Diffie-Hellman
El-Gamal signatures
DSS
Zero-knowledge signatures

UNIT 5: Authentication:

Password Based, Address Based, Cryptographic Authentication

Passwords in distributed systems, on-line vs offline guessing
 Cryptographic Authentication: passwords as keys, protocols, KDC's Certification Revocation, Interdomain, groups, delegation
 Authentication of People: Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics

UNIT 6: Security Policies and Security Handshake Pitfalls:

Security policy
 High and low level policy
 Protocol problems, assumptions
 Shared secret protocols, public key protocols
 Mutual authentication, reflection attacks
 Session keys, one-and two-way public key based authentication

Suggested Readings:

Atul Kahate, 2017, Cryptography and Network Security, McGraw Hill.
 Kaufman, C., Perlman, R., and Speciner, M., 2002, Network Security, Private Communication in a public world, Prentice Hall PTR.
 Stallings, W., 2003, Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR.
 Stallings, W., 2000, Network security Essentials: Applications and standards, Prentice Hall.
 Behrouz A Forouzan, 2007, Cryptography and Network Security; McGraw Hill.

Note: Only latest editions of the books are recommended. Web

Links:

<https://www.mygreatlearning.com/blog/cryptography-tutorial/> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

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(lxxxv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(lxxxvi) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
O6.0CA206E02.1	3	1	2	2	3		3						3	2
O6.0CA206E02.2	2	2	2	3	1		2						3	2
O6.0CA206E02.3	1	1	2	1	2								2	1
O6.0CA206E02.4	2	1	2	1	1		3						1	2
O6.0CA206E02.5	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)

O6.0CA207E02: ETHICAL HACKING

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

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:

O6.0CA207E02.1 Understand about Ethical hacking and penetration testing.

O6.0CA207E02.2 Solve various types of attacks, security threats and vulnerabilities present in the computer system.

O6.0CA207E02.3 Examine how social engineering can be done by an attacker to gain access to useful & sensitive information about confidential data.

O6.0CA207E02.4 Understands cryptography, and the basics of web application attacks.

O6.0CA207E02.5 Implement tools, techniques and ethical issues likely to face the domain of ethical hacking and ethical responsibilities.

Unit 1: Introduction to Ethical Hacking

Introduction

Different types of hackers, Five phases of hacking

Scope of Ethical Hacking, Brush up Linux, Brush up networking

Information Gathering: Passive Information Gathering, Active Information Gathering

Unit 2: System Hacking

Scanning

System Hacking: Introduction to Metasploit Framework,

Exploit MS17-010 Vulnerability,

Reverse TCP Connection

Unit 3: Introduction to Android hacking

Privileged Escalation using post exploit bypassuac and getsystem,

Reverse connection in different network using port forwarding

Android hacking using reverse TCP connection

Unit 4: Software based vulnerabilities (Badblue/ice blaster)

Introduction

Types of Software Vulnerabilities

Common Vulnerable Components

Attack Vectors and Exploitation Techniques

Impact and Consequences:

Unit 5: Introduction to Active Directory

Introduction

OU, DC, TREE, FOREST

LDAP, AD working,

SMB and SPN

Unit 6: Introduction to Kerberos and Cryptography

Introduction, Kerberos working (Authentication Server, Ticket Granting Server, TGT Kerberoasting attack, Mention, ASREPROASTING, Golden Ticket.
 Cryptography: Symmetric Encryption Algorithm, Asymmetric Encryption Algorithm, Hash Algorithm, Steganography, Prevention

Suggested Readings:

Jon Erickson, 2008, Hacking: The art of Exploitation, No Starch Press.
 Peter Kim, 2013, The Hacker Playbook 2, Syngress

Note: Only latest editions of the books are recommended.

Web Links:

<https://www.javatpoint.com/ethical-hacking> (Last Visited Date: 22nd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

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Assessment Tools:

Assignment/Tutorials
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COURSE ARTICULATION MATRIX:

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O6.0CA207E02.1	1	2	2		3		3						3	1
O6.0CA207E02.2	2	3	1		2		2							
O6.0CA207E02.3	1	3	2	1	2								2	2
O6.0CA207E02.4	1			1	2		3						2	2
O6.0CA207E02.5		1	2	1			2	3	2				2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA208E02: GAMING TECHNOLOGY-II

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

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:

06.0CA208E02.1. Understand basic principles of Game Design and Game Design Process.

06.0CA208E02.2. Understand importance of standards for good quality code and testing

06.0CA208E02.3. Basics of display technology, Software Development Kit (SDK), Application Programming Interface (API).

06.0CA208E02.4. Understand basic design guidelines for gaming application,

CA208E02.5. Industry wide best practices and various ways in game to grab inputs from various devices.

06.0CA208E02.6. Develop a small game based on the learning.

UNIT I: INTRODUCTION TO GAMING

Core Design: What Is a Game?

Gameplay meaning and creating the Game Specification

Initial Design: The Beginning.

Hardware Abstraction.

The Problem Domain.

Thinking in Tokens.

UNIT II: TECHNOLOGY

Use of Technology: The State of the Art.

Blue-Sky Research.

Reinventing the Wheel.

Use of Object Technology, Building Bricks: Reusability in Software

Initial Architecture Design: The Birth of Architecture.

The Tier System and Architecture Design.

UNIT III: DEVELOPMENT

The Development Process.

Code Quality and Coding Priorities.

Debugging

Module Completion.

The Seven Golden Gambits- The Three Lead Balloons.

UNIT IV: GAME PROGRAMMING

Game Programming Technologies

Display, Mixing 2D and 3D, DirectX,

User Interface code

Resource caching

Main loop.

UNIT V: DESIGN PRACTICES

Smart & naked pointers

Correct use of memory

Game scripting languages
User focus, Scenarios and Navigation Design
Screen Design, Prototyping techniques and Wire-Framing
Understanding the UI Layer and Its Execution Framework

UNIT VI: BUILDING YOUR GAME

Creating a project, source code repositories and version control,
Building the game and scripts,
User interface programming
input devices: Getting the Device State,
Working with the Mouse (and Joystick), Keyboard,
User Interface Components and more Control Properties.

Reference Books:

E. N. Barron, Game Theory: An Introduction, Wiley Student Edition.
Gary Rosenzweig, ActionScript 3.0 Game Programming University, Pearson Education.
Andrew Rollings and Dave Morris, 2003, "Game Architecture and Design", New Riders.
Mike McShaffry, "Professional Game Programming", Dreamtech Press.

Web Links:

<https://www.toptal.com/game/video-game-physics-part-i-an-introduction-to-rigid-body-dynamics> Last Visited
Date: 22-02-2024

<https://www.cgspectrum.com/blog/game-design-basics-how-to-start-building-video-games> Last Visited Date: 22-
02-2024

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

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Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

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O6.0CA208E02.2	3	3	2	2	2	2	1	1	2	2	2	2	2	1
O6.0CA208E02.3	3	2	2	2	2	2	2	1	2	2	2	2	2	2
O6.0CA208E02.4	3	3	2	2	2	2	2	1	2	2	2	2	2	3
O6.0CA208E02.5	3	2	2	2	2	2	2	1	1	2	2	2	2	3
O6.0CA208E02.6	3	3	2	3	2	2	2	1	2	3	3	1	2	3

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA209E02: ANGULAR

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

Pre-Requisite: Basic Knowledge on HTML, CSS, BOOTSTRAP, JAVASCRIPT

Course Type: Domain Elective

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

06.0CA209E02.1 Define the architecture of Angular application

06.0CA209E02.2 Understand the Angular concepts, including components, modules, services, and directives

06.0CA209E02.3 Develop modern, complex, responsive and scalable web applications with Angular

06.0CA209E02.4 Create the applications from JavaScript framework

Unit-1: Introduction to Angular

What is Angular

Difference between Angular 2.0 vs 7.0

Angular CLI and Troubleshooting

Node JavaScript Introduction

Setup a Project

Setup Node js with angular

Typescript Introduction

What is bootstrap

Create Your First App

Unit-2: Modules and Components

What is Component in Angular js

What is Module in Angular js

Create and Start Component

Why Components are important.

How we create a component

Create Component using CLI

What is nesting Component

What is Component Template

Component Styles and Selectors

Unit-3: Data Binding in Angular

What is Data binding

Splitting Application into Component

String Interpolation

What is Property Binding

Difference between Property Binding and String Interpolation

Binding with Custom Events.

What are Binding Properties and Events

Two Way binding

Combine Forms with Data binding

Custom Properties

What is Encapsulation

How to Use Local Reference in Templates Access and DOM

Component Lifecycle

What are Hooks in Angular js
Access Template with Hooks

Unit-4: Directives in Angular js

What are Directives
Using Output Data Conditionally
What is ng if and else condition
Output List
Styling Element with ngStyle
How to apply CSS class dynamically with angular js
How to Create Basic Attribute Directive
What is Renderer
What is Host Binding and Host Listener
Directive Properties

Unit-5: Dependency Injection in Angular js

What is Dependency Injection
What are Services
Logging Service and Injection
Create Data Service
Instance of Services
Insert Service into Services
How to use service in Cross Component?
What is Hierarchical Injector

Unit-6: Angular Modules

What is idea behind Modules
What is feature Modules and how we create it
What are App Modules
Registering Routes in Feature Modules
What is Shared Module and how we create
Create the Auth Feature module

Suggested Readings:

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.
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:

<https://www.tektutorialshub.com/angular-tutorial/> (last visited date: 22 February 2024)
<https://angular.io/guide/example-apps-list> (last visited date: 22 February 2024)
<https://www.javatpoint.com/angular-8> (last visited date: 22 February 2024)
https://www.w3schools.com/angular/angular_examples.asp (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

- (xci) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

- (xcii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA209E02.1.	3	2	1			2							1	1
O6.0CA209E02.2.		1		1			1	1	1	2			3	2
O6.0CA209E02.3.			3						1					
O6.0CA209E02.4.		3						1					3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA210E02: AUTOMOTIVE COMPUTING

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Cloud Computing

Course Type: Domain Elective

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

06.0CA210E02.1 Demonstrate competency in the use of personal computers and business application software as required by the automotive industry.

06.0CA210E02.2. Describe data types, basic computer architecture and concepts, systems and components, and OEM/aftermarket automotive computer diagnostic systems.

06.0CA210E02.3. Demonstrate skills and knowledge of microcontrollers and microcontroller programming, and basic analog and digital signal acquisition and control.

06.0CA210E02. 4. Demonstrate analytical and critical reasoning skills for problem solving of automotive computing case studies.

06.0CA210E02.5. Demonstrate basic knowledge of data communications as applied to automotive technology.

UNIT 1: Application Software on Personal Computers

Microsoft Word: Document-creating, Formatting, Finalizing

Microsoft Excel: Sheet-Creating, Formatting, Finalizing

Microsoft PowerPoint: Presentation-Creating, Finalizing

Microsoft Access: Database-Creating, Finalizing

Robotic systems and devices for health care and medicine

Technologies to promote a healthy and secure society

UNIT 2: Computer Basics

Data Types and Structures

Computer Hardware and Software

Operating Systems

UNIT 3: Microcontroller Basics

I/O Signals and Control

Memory (RAM/ROM/EEPROM)

Programming

UNIT 4: Automotive Computer Diagnostic

OBD II and CAN Bus

OEM/Aftermarket Scan

UNIT 5: Automotive Hardware and Computing system

Introduction to modern hardware and computing systems

Hypervisor OS

Telematics Systems

Infotainment Systems

Smartphone Apps Integration

UNIT 6: Automotive Mobile Apps

Wireless networking
Mobile and wearable sensing
Multi-gigabit wireless networks
Internet of things

Suggested Readings:

Parsons & Oja, 2011, Practical Microsoft Office 2010: Text w/CD, (1st ed.), Cengage.
Matthew Gast, 2012, 802.11n: A Survival Guide, O'Reilly Media.
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)(Last Visited Date: 23rd February, 2024)
Automotive-embedded-systems.pdf (buffalo.edu).(Last visited Date: 23rd February, 2024)
Role of Advanced Hardware and Software Platforms in the Automotive Industry (einfochips.com).(Last visited Date: 23rd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xciii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(xciv) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA210E02.1	1	1		2			2	3		2		2	3	3
O6.0CA210E02.2	3	3		2			3	3		2		2	2	

O6.0CA210E02.3	1	1	3		2		3	3		2	3		2	1
O6.0CA210E02.4	1	1	1	2	2		2	3			3		1	
O6.0CA210E02.5	1	1		2			3	3		2	3			3

MRIR

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O6.0CA211E02: MOBILE GAMES

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Nil

Course Type: Domain Elective

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

O6.0CA211E02.1 Understand the fundamental concepts of game theory.

O6.0CA211E02.2 Acquire proficiency in constructing and analyzing mathematical models to represent strategic interactions.

O6.0CA211E02.3 Analyze various strategic situations, identify the key players, their preferences, and available choices.

O6.0CA211E02.4 Model and analyze a wide range of strategic interactions using game-theoretic frameworks.

CA211E02.5 Will gain insights into decision-making under uncertainty through concepts like probability, risk, and expected utility theory within the framework of game theory

Unit 1: Introduction to Game Theory

Game theory,
Theory of rational choice,
Interacting decision makers

Unit 2: Strategic Games and Nash Equilibrium

Strategic games: examples,
Nash equilibrium: concept and examples, Best response functions,
Dominated Actions, Symmetric games and symmetric equilibria,
Illustrations of Nash Equilibrium,
Cournot's model of duopoly market

Unit 3: Bertrand's model of duopoly market

Electoral Competition,
War of Attrition, Auctions,
Accident Laws

Unit 4: Mixed Strategy Nash Equilibrium

Introduction, Strategic games with randomisation,
Mixed strategy Nash equilibrium: concept and examples
Dominated Actions,
Formation of Players' beliefs

Unit 5: Extensive Games and Nash Equilibrium

Introduction to extensive games,
Strategies and outcomes,
Nash equilibrium, Subgame perfect Nash equilibrium,
Backward induction

Unit 6: Illustrations of Extensive Games and Nash Equilibrium

Stackelberg model of duopoly markets,
Ultimatum game

Suggested Readings:

Osborne, M.J., 2004, An Introduction to Game Theory, Oxford University Press.
Mas-Colell, A., M.D. Whinston and J.R. Green, 1995, Microeconomic Theory, Oxford University Press.

Web links:

<https://www.geeksforgeeks.org/how-to-get-started-with-game-development/amp/> (Last Visited Date: 22nd February, 2024)

<https://www.munotes.in/sem5techmaxgp.html> (Last Visited Date: 22nd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xcv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(xcvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA211E02.1	1	2	2	3	3			2					3	1
O6.0CA211E02.2	1	2	2	3	1				2				3	2
O6.0CA211E02.3	1	3	2	1	2								2	1
O6.0CA211E02.4	1	2	2						3	3			2	1
O6.0CA211E02.5	1	2	1		3	2	2				1	1		

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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O6.0CA212E02: COMPOSITING & VISUAL EFFECTS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Multimedia
Course Type: Doman Elective

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

- O6.0CA212E02.1. Understand the different toolset meant for multimedia
- O6.0CA212E02.2. Learn processing of 3D images
- O6.0CA212E02.3. Acquire profound knowledge in photographic applications of 3D images
- O6.0CA212E02.4. Hands on practice in creating realistic and immersive scenes
- CA212E02.5. Optimize the visuals along with the effects using techniques like various multi-pass rendering techniques
- O6.0CA212E02.6. Create movies, videos and games using creative tools like matting and Chroma Keys

UNIT 1: Introduction to Toolsets

Brief history of compositing and visual effects
Deconstructing digital images and the rendering process
Fundamental 3D and digital compositing principles
Comparing the Nuke and After Effects compositing engines
Pre-multiplied vs. non-pre-multiplied images Reading

UNIT 2: Photographic applications for 3D

Deconstructing cameras and the photographic process
Camerawork fundamentals
Aspect ratios, standards, focus, and exposure principles
Shooting and image processing for a background plate
Discuss perspective and depth cues

UNIT 3: Advanced photographic applications for 3D

Texture gathering
Limitations of standard low-dynamic range images
Shooting and Processing High Dynamic Range Images
Applications for HDRI in 3D Reading

UNIT 4: Compositing 3D with Live Action

Setup and matching of 3D lighting to a background plate
Exporting multiple render passes and compositing for shadows
Image based lighting and reflections
Realistic materials
Ideal specifications for diffuse texturing
Contrasting game asset texturing to cinematic asset texturing

UNIT 5: Multi-pass Rendering

Using render layers to optimize multi-pass rendering
Multi layer compositing principles and techniques

MRIPRS

Diffuse, color, shadows, reflections, and occlusion
Advanced multi-Pass Rendering (specialty layers and channels, Z-Depth vs. Luminance depth, Image bit depth, 8-bit vs. 16 bit vs. floating point)
Node based compositing principles and techniques
Color correction and post effects

UNIT 6: Film, Video, Matting, and Chroma Keying

Deconstructing film, video, and digital video standards
Aspect ratios, file formats, and frame rates
Types of mattes and matting techniques
Chroma Keying , Making and mattes for 2D elements vs. 3D elements
Rotoscoping and wire removal
Matting Techniques for Particle Systems

Suggested Readings:

Mark Spencer, 2009, Apple Pro Training Series: Motion 4, Peachpit Press.
Damian Allen, 2007, Apple Pro Training Series: Motion 3, Peachpit Press.
Damian Allen, Brian Connor, 2006, Apple Pro Training Series: Encyclopedia of Visual Effects, Peachpit Press.
Jeffrey A. Okun and Susan Zwerman, 2020, The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures, Routledge.
Bill Byrne, 2009, The Visual Effects Arsenal: VFX Solutions for the Independent Filmmaker, Routledge.

Web Links:

VFX Compositing & Visual Effects: After Effects Tutorials | Udemy (Last visited Date: 23-February, 2024)
[What Is Compositing in Video Editing? A Beginner's Guide - Storyblocks](#) (Last visited Date: 23-February, 2024)

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Evaluation Policy:

The evaluation will include two types of assessments:

(xcvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(xcviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA212E02.1	1	1		2	3		3	2					3	3
O6.0CA212E02.2	1	1	1	1	1		2	2			3		3	3
O6.0CA212E02.3	1	1		1	2			2			3		2	3
O6.0CA212E02.4	1		1		1		2	1			3		2	2
O6.0CA212E02.5	1	2	1		2			3			2		2	2
O6.0CA212E02.6	2		2				2				3		3	

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O6.OCA213E02: MODELLING & TEXTURING

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

Max. Marks: 100
Continuous Evaluation : 30
End Semester Examination : 70

Pre-Requisite: Multimedia

Course Type: Doman Elective

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

- O6.OCA213E02.1 Understand the structure of modern graphics.
- CA213E02.2 Develop and design drawings that demonstrate modelling and design skills.
- O6.OCA213E02.3 Make use of the key algorithms for modeling and rendering graphical data.
- O6.OCA213E02.4 Develop, design and problem solving skills with application to computer graphics.
- O6.OCA213E02.5 Implement various graphical features like clipping, filling etc.

Unit 1: Introduction to Media

Introduction to "Visual Communication", A brief History of animation
Development throughout the age
Different types of animation production,
Introduce the Production Methodology behind Animation film production
I Pre-Production.
II Production.
III Postproduction

Unit 2: Object Modelling

Making the Object in BLENDER,
Add 'materials and shading',
Basics of "TEXTURING,UV Mapping",
Basics of "LIGHTING",
Basics of "RENDER AND COMPOSITING"

Unit 3: Character Modelling

Introduce different 'styles of characters used for animation and gaming,
Create own character,
Detailed Study on Character Design,
Clay Modelling methodology.

Unit 4: Textures in 3D Model

Basics of Armature
3D Model of a proposed Character,
Experiment special features and mannerisms to character,
Identify the texture for developed characters, Deals with some procedural Textures

Unit 5: Blender 3D UVW

Learning Blender 3D UVW Maps and Unwrapping
A Mesh, lighting to character
Compositing and Enhancement Phase.

Unit 6: BG modelling

Learn basic of "Perspective",
Environment Modelling

MRPDRS

steps to develop an atmosphere
 3D UVW Maps and Unwrapping
 texturing and shading of realistic backgrounds for animation, rendering, compositing.

Suggested Readings:

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
 D. S. Ebert, 1998, Texturing and Modeling: A Procedural Approach, 2nd Ed., Academic Press Inc

Web Links:

<https://www.a23d.co/blog/what-is-3d-texturing/> (Last Visited Date: 23rd February, 2024)
<https://www.oreilly.com/library/view/3d-animation-essentials/9781118147481/9781118239056c05.xhtml> (Last Visited Date: 23rd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(xcix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

- MCQs 30%
- Subjective (Short/Long) 40%
- Discussion/Presentation 15%
- Projects/Group Activities etc 15%

(c) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

- Objective Type Questions: 30%
- Short/Long Questions: 70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
O6.0CA213E02.1	3	3	2	2	3		3						2	1
O6.0CA213E02.2	1	1	2	2	2		1						3	1
O6.0CA213E02.3	1	2	2	1	2								2	1
O6.0CA213E02.4	1	1	3	2	1		3						1	1
O6.0CA213E02.5	1	2	2	1			2				2		1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA214E02: ADVANCE DATABASE SYSTEMS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Database Management System

Course Type: Domain Elective

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

OO6.0CA214E02.1 Understand the concept of Advance Database Base Management System.

OO6.0CA214E02.2 Explore the relational databases and its different models.

OO6.0CA214E02.3 Apply advance SQL queries and PL/SQL programs. OO6.0CA214E02.4 Analyze the different database security issues.

CA214E02.5 Create and implement the ER and EER diagrams.

UNIT 1: Relational Database Design and Implementation

Introduction to Relational Database Management System

Features of Good Relational Database Management System

Enhanced ER tools

Converting EER diagram to tables

Different Table Constraints and Characterization

Normalization: UNF, 1NF, 2NF, 3NF, EKNF, BCNF, 4NF, ETNF, 5NF, DKNF, 6NF

Inclusion Dependencies and Template Dependency

UNIT 2: Emerging Database Technologies, Applications and Environments

Database Concepts and its Architecture

Object Oriented Database

Object Relational Database

Active Database

Temporal Database

Spatial Database

Deductive Database

Mobile Database

Query Processing

Geographic Information System

Data Warehousing and Data Mining

UNIT 3: Advance SQL and PL/SQL

SQL Query Statements

Advance SQL Queries

SQL Operations: Selection, Join, Sorting, Grouping

Transformation of Relational and Logical Operations

SQL Functions

Storage and Query Optimization

Views and Query Processing

Cursors: Implicit and Explicit

Database Triggers

Exception Handling

Sub Programs: Procedures and Functions

UNIT 4: Distributed Databases

Centralized versus non centralized Database
Homogeneous and Heterogeneous DDBMS and their comparison
Functions and Architecture
Distributed database design, query processing in DDBMS
Distributed concurrency management, deadlock management
Concepts of replication servers

UNIT 5: Database Security and Authorization

Introduction to Database Security
Problems in Database Security and Conclusions
Levels of Database Security
Access Control
Multilevel Security
Statistical Database Security
Examples of E-Security

UNIT 6: Transaction Management and Recovery Process

Advanced feature of Transactions
Enhanced Lock Based and timestamp-based Protocols
Deadlock Handling
Weak Levels of Consistency
Recovery and Atomicity
Recovery with Concurrent Transaction
Advanced Recovery Techniques
Remote Backup Systems

Suggested Readings:

Elmasri and Navathe, 2016, Fundamentals of Database Systems, Pearson Education
Raghu Ramakrishnan, 2003, Database Management Systems, Johannes Gehrke, , McGraw-Hill
Korth, Silberchatz, Sudarshan, 2011, Database System Concepts, McGraw-Hill.
Peter Rob and Coronel, 2010, Database Systems, Design, Implementation and Management, Thomson Learning.
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/> (last visited date: 22 February 2024)
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm (last visited date: 22 February 2024)
<https://www.tutorialspoint.com/html/index.htm> (last visited date: 22 February 2024)
<https://www.w3schools.com/> (last visited date: 22 February 2024)

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Evaluation Policy:

The evaluation will include two types of assessments:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA214E02.1		1	2	3		2		2		3	3		3	2
OO6.0CA214E02.2	1	2	2	3	3	3		2	2		3		2	1
OO6.0CA214E02.3	1	1	2		2		2		3		2	2	2	2
OO6.0CA214E02.4		3	2	3			2			3			2	3
OO6.0CA214E02.5	1	1	2		2				2	3			2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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OO6.0CA215E02: SOCIAL NETWORK ANALYTICS

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

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:

OO6.0CA215E02.1. Do Online interactive demonstrations and hands-on analysis of real-world data sets

OO6.0CA215E02.2. Analyse the structure and evolution of network

OO6.0CA215E02.3 Formulate agent based model which from local behaviour of agent can generate network with diverse global structure.

CA215E02.4 Know how to conduct computer simulation to analyse properties of such model.

Unit-1: Introduction

Social network data-Formal methods-

Paths and Connectivity-Graphs to represent social relations-

Working with network data-

Network Datasets-Strong and weak ties - Closure, Structural.

Unit-2: Social Influence

Homophily- Mechanisms Underlying Homophily,

Selection and Social Influence, Affiliation,

Tracking Link Formation in On-Line Data,

Spatial Model of Segregation –

Positive and Negative Relationships - Structural Balance - Applications of Structural Balance, Weaker Form of Structural Balance.

Unit-3 Information Networks and The World Wide Web

The Structure of the Web-World Wide Web-

Information Networks, Hypertext

Associative Memory- Web as a Directed Graph,

Bow-Tie Structure of the Web-Link Analysis

Web Search Searching the Web: Ranking

Unit-4: Information Networks and The World Wide Web

Link Analysis using Hubs and Authorities-

Page Rank-

Link Analysis in Modern Web Search, Applications,

Spectral Analysis, Random Walks, and Web Search.

Unit-5: Social Network Mining

Clustering of Social Network graphs: Betweenness, Girvan Newman Algorithm-

Discovery of communities-

Cliques and Bipartite Graphs-Graph Partitioning Methods-

Matrices-Eigen values Sim-rank

Unit-6: Network Dynamics

Cascading Behaviour in networks: Diffusion in Networks,
Modelling Diffusion-Cascades and Cluster,
Thresholds, Extensions of the Basic Cascade Model-
Six Degrees of Separation-Structure and Randomness,
Decentralized Search- Empirical Analysis and Generalized Models-
Analysis of Decentralized Search.

Suggested Readings:

Easley and Kleinberg, 2010, Networks, Crowds, and Markets: Reasoning about a highly connected world, Cambridge Univ. Press.
Robert A. Hanneman and Mark Riddle, 2005, Introduction to social network methods, University of California.
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> (Last visited Date: 23-02-2024)
https://aberdeenstudygroup.github.io/studyGroup/lessons/SG-T21-SocialNetworkAnalysis/SNA_tutorial/ (Last visited Date: 23-02-2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(ciii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(civ) For Summative assessment (End Semester Examination or End-Term Examination):
Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA215E02.1.	3	3			2	2						1		
OO6.0CA215E02.2.		2	2	3		1		3				2		1
OO6.0CA215E02.3.	3	2		2	1									
OO6.0CA215E02.4.	3		2		2	1								

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

OO6.OCA216E02: COMMUNICATION TECHNOLOGIES IN IoT

Periods/week	Credits	Max. Marks: 100
L: 2	2	Continuous Evaluation: 30
Duration of Examination: 3 Hrs		End Semester Examination: 70

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

OO6.OCA216E02.1. Understand the fundamentals of IOTs.

CA216E02.2. Know the concept of simulation of IoT environment

OO6.OCA216E02.3. Learn the technologies of Interfacing sensors with IoT

Environment OO6.OCA216E02.4. Be exposed to various Communication protocols in

IoT OO6.OCA216E02.5. Understand application of IoT communication in Cloud

Environment

Unit-1: Introduction to IOT

Understanding IoT fundamentals

IOT Architecture and protocols

Various Platforms for IoT

Real time Examples of IoT

Overview of IoT components and IoT Communication Technologies

Challenges in IOT

Unit-2: Arduino Simulation Environment

Arduino Uno Architecture

Setup the IDE, Writing Arduino Software

Arduino Libraries

Basics of Embedded C programming for Arduino

Interfacing LED, push button and buzzer with Arduino

Interfacing Arduino with LCD

Unit-3: Sensor & Actuators with Arduino

Overview of Sensors working

Analog and Digital Sensors

Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino

Interfacing of Actuators with Arduino.

Interfacing of Relay Switch and Servo Motor with Arduino

Unit-4: Basic Networking with ESP8266 WiFi module

Basics of Wireless Networking

Introduction to ESP8266 Wi-Fi Module

Various Wi-Fi library

Web server- introduction, installation, configuration

Posting sensor(s) data to web server

Unit-5: IoT Protocols

M2M vs. IOT

Communication Protocols

M2M and WSN Protocols
SCADA and RFID Protocols
Issues with IoT Standardization
Unified Data Standards
Protocols – IEEE802.15.4
BACNet Protocol

Unit-6 . Cloud Platforms for IOT

Virtualization concepts and Cloud Architecture
Cloud computing, benefits
Cloud services -- SaaS, PaaS, IaaS
Cloud providers & offerings
Study of IOT Cloud platforms
ThingSpeak API and MQTT
Interfacing ESP8266 with Web services

Suggested Readings:

Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Note: Only latest editions of the books are recommended.

Web Links:

<https://data-flair.training/blogs/iot-technology/> (Last visited Date: 28-02-2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA216E02.1.	3	3			2	2						1		
OO6.0CA216E02.2.		2	2	3		1		3				2		1
OO6.0CA216E02.3.					1		2			2	3		1	
OO6.0CA216E02.4.	1			1					2					2
OO6.0CA216E02.5	1	2	2		2					2			2	2

MARRIERS

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

OO6.0CA217E02: SOFTWARE & PROGRAMMING IN IoT

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Co-Requisite: Computer networks

Course Type: Domain Elective

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

- OO6.0CA217E02.1. Able to understand the basic concepts of IoT as well as role in modern day life
- OO6.0CA217E02.2. Learn programming on an electronic platform like microcontroller
- OO6.0CA217E02.3. Get hands on experience in designing various IoT applications
- OO6.0CA217E02.4. Design some IoT based prototypes
- OO6.0CA217E02.5. Learn interoperability between various electronic platforms for information exchange

UNIT 1: Introduction to IoT

Understanding the IoT fundamentals
IoT architecture and protocols
Various platforms for IoT
Real time examples of IoT
Overview of IoT components and IoT communication Technologies
Challenges in IoT

UNIT 2: Interaction with Arduino

Arduino Simulation Environment
Arduino Uno Architecture
Setup the IDE, Writing Arduino Software
Arduino Libraries
Basics of Embedded C programming for Arduino
Interfacing LED, push button

UNIT 3: Programming with Arduino

Sensor and Actuators with Arduino
Overview of Sensors working
Analog and Digital Sensors
Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino
Interfacing of Actuators with Arduino.
Interfacing of Relay Switch and Servo Motor with Arduino

UNIT 4: Interaction with Raspberry Pi

Interfacing Hardware with the Raspberry Pi
Raspberry Pi Remote Access, operate the Raspberry Pi in "headless mode", Bash Command line, operating Raspberry Pi without needing a GUI interface
Introduction to Cloud Storage models and communication APIs.
Web server & cloud for IoT
Python web application framework
Designing a RESTful web API via connecting to APIs

UNIT 5: Designing through Raspberry Pi

IoT Design using Raspberry Pi IoT Applications based on Pi
LAMP Web-server, GPIO Control over Web Browser
Creating Custom Web Page for LAMP
Communicating data using on-board module
Home automation using Pi, Node-RED, MQTT Protocol
Using Node-RED Visual Editor on Rpi

UNIT 6: Networking with Arduino & Raspberry Pi

Basic Networking with ESP8266 WiFi module & Wireless Networking
Introduction to ESP8266 Wi-Fi Module
Web server- introduction, installation, configuration
Posting sensor(s) data to web server
5. Cloud Platforms for IOT
Virtualization concepts and Cloud Architecture alongwith the benefits of cloud computing
Cloud services -- SaaS, PaaS, IaaS & Interfacing ESP8266 with Web services

Suggested Readings:

Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web, Wiley Publications
Olivier Hersent, David Boswarthick, and Omar Elloumi, — "The Internet of Things: Key Applications and Protocols",
Wiley Publications
Vijay Madiseti and Arshdeep Bahga, 2014, "Internet of Things (A Hands-on-Approach)", VPT.
J. Biron and J. Follett, 2016, "Foundational Elements of an IoT Solution", O'Reilly Media.
Keysight Technologies, 2016, "The Internet of Things: Enabling Technologies and Solutions for Design and Test",
Application Note.
Daniel Minoli, 2013, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M
Communications", Wiley Publications.
Pethuru Raj and Anupama C. Raman, 2017, "The Internet of Things: Enabling Technologies, Platforms, and Use
Cases", CRC Press.

Web Links:

Getting Started with Arduino UNO | Arduino.(Last visited date: 23-02-2024)
Design Your Own Raspberry Pi Compute Module PCB : 5 Steps (with Pictures) - Instructables.(Last visited Date: 23-02-2024)
How to Use the ESP8266 for Wireless Communication With Arduino and Raspberry Pi | ESP8266 | Maker Pro.(Last visited Date: 23-02-2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

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MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO 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	PSO 1	PSO 2
OO6.0CA217E02.1	1	1	2	2	3		3	2					3	3
OO6.0CA217E02.2	1	1	1	1	1		2	2			3		3	3
OO6.0CA217E02.3	1	1		1	2		2	2			3		2	3
OO6.0CA217E02.4	1		1	1	1		2	1			3		2	2
OO6.0CA217E02.5	1		1		1		1	2			2		2	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

OO6.0CA218E02: DATA ANALYTICS AND VISUALIZATION USING EXCEL

Periods/week

Credits

Max. Marks: 100

L: 2

2

Continuous Evaluation: 30

Duration of Examination: 3 Hrs

End Semester Examination: 70

Pre-Requisite: Basics of MS-EXCEL

Course Type: Domain Elective

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

OO6.0CA218E02.1. Generate spreadsheets with appropriate formatting, layout, proofing.

OO6.0CA218E02.2. Draw analysis on data using spreadsheets and use interpretation.

CA218E02.3. Make meaningful representations of data in the form of charts and pivot tables.

OO6.0CA218E02.4. Develop ability to deal with numerical and quantitative problems in workbooks. OO6.0CA218E02.5. Effectively use the analytics and visualisation tools in

Spreadsheets.

UNIT 1: Introduction to Excel

MS Excel screen elements – Tool bar, title bar, ribbon, formula bar, status bar.

Moving around a Worksheet,

Entering and formatting (e.g. Number, Text, Date and Currency) data.

Cell referencing (relative, absolute, mixed),

Using formulae,

Use of Find, Replace, Goto.

UNIT 2: Working with Excel

Insert, delete - cells, rows, columns.

Sorting (basic, custom),

Filtering, grouping, ungrouping data,

Dealing with subtotals and grand totals.

Validating data, protecting cells

Pivot Tables.

UNIT 3: Conditional Formatting with Excel

Recording Macros, Absolute and relative macros, editing macros

Use of spinner buttons and command buttons;

Sub Procedure, Function Procedure

If_Then_Else; Simple If Function Nested Functions

Working with Loops: Do_while loop, For_Next loop;

Creating User Forms: Message Box, Input Box

UNIT 4: Functions in Excel

Formula Functions – Sum, Average, if, Count, max, min

Date and Time Functions

Financial Functions

Logical Functions

Lookup and Reference Functions

Math and Trigonometry Functions

Statistical Functions

Text Functions

UNIT 5: Data Representation in Excel

Creating Charts
Editing a Chart- Changing the Chart Type and Orientation of the Data Series
Editing chart Titles, Legend and Gridlines,
Moving and resizing the embedded chart.
Create and Manage Pivot Tables
Create and Manage Pivot Charts

UNIT 6: Data Viewing and Reviewing in Excel

Data Viewing and Reviewing
Inserting comments,
Spell checks
Manipulation to the worksheet data etc,
Viewing data in different ways eg. Page break, normal etc

Suggested Readings:

Data Visualization in Excel: A Guide for Beginners, Intermediates, and Wonks (AK Peters Visualization Series), AK Peters Publication, CRC Press, 2023
Michael Alexander, Dick Kusleika, Excel 2019 Power Programming with VBA, Wiley
Chandan Sengupta, Financial Analysis and Modelling Using Excel and VBA, Second Edition, Wiley Student Edition.

Note: Only latest editions of the books are recommended. Web

links:

A Step-by-Step Guide to Advanced Data Visualization (policyviz.com) (Last visited Date: 22-02-2024)
Excel Data Analysis - Data Visualization (tutorialspoint.com) (Last visited Date: 22-02-2024)
Data Visualization in Excel - GeeksforGeeks (Last visited Date: 22-02-2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
OO6.0CA218E02.1	1	1	1	2			2	3				2	3	3
OO6.0CA218E02.2	3	3		2			3	3				2	2	
OO6.0CA218E02.3	1	1	3		2		3	3					2	1
OO6.0CA218E02.4	1	1	1	2	2		2	3					1	
OO6.0CA218E02.5	1	1		2	3		3	3		1	3	3		3

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

06.0CA219E02: DATA ANALYTICS & VISUALIZATION USING PYTHON

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Basics of Python Programming

Course Type: Domain Elective

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

O6.0CA219E02.1. Generate Python scripts for data analysis with appropriate documentation.

O6.0CA219E02.2. Apply Python libraries for data analysis and interpretation.

O6.0CA219E02.3. Create data visualizations using Python libraries such as Matplotlib and Seaborn, and effectively use charts and pivot tables for data representation.

O6.0CA219E02.4. Analyze and solve numerical and quantitative problems using Python's data analysis and manipulation tools.

CA219E02.5. Apply advanced data analytics and visualization techniques to solve real-world problems.

UNIT 1: Introduction to Data Analytics and Python

Introduction to Data Analytics
Python Basics for Data Analysis
Data Structures in Python (Lists, Dictionaries, etc.)
Control Structures and Functions

UNIT 2: Data Manipulation with Python

Pandas Library for Data Manipulation
Data cleaning and Preprocessing
Handling Missing Data
Data Aggregation and Grouping

UNIT 3: Data Visualization

Introduction to Data Visualization
Types of Data Visualizations
Role of Data Visualization in Data Analysis
Principles of Effective Data Visualization in Data Analysis
Python Libraries for Data Visualization

UNIT 4: Introduction to Matplotlib

Matplotlib for Static Visualizations
Creating Line Plots with Matplotlib
Scatter Plots and Customization with Matplotlib
Generating Bar Charts and Histograms
Interactive Visualizations with Plotly

UNIT 5: Seaborn for Enhanced Data Visualization

Introduction to Seaborn
Creating Statistical Visualizations with Seaborn
Utilizing Seaborn Themes and Color Palettes
Advanced Visualizations with Seaborn

UNIT 6: Creating Custom Visualizations

Combining Matplotlib and Seaborn
 Creating Subplots and Layouts
 Adding Annotations and Text to Visualizations
 Interactive Visualizations with External Libraries

Suggested Readings:

Charles Severance, 2022, "Python for Everybody: Exploring Data in Python 3.
 McKinney, W., 2017, Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O'Reilly Media.
 O'Neil, C., & Schutt, R., 2013, Doing Data Science: Straight Talk from the Frontline O'Reilly Media.

Note: Only latest editions of the books are recommended. Web

links:

Packages of Data Visualization in Python - Javatpoint (last visited date: 22 February 2024)
 Introduction to Data Visualization in Python (gilberttanner.com) (last visited date: 22 February 2024)
 Data Visualization with Python - GeeksforGeeks (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

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Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxii) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA219E02.1.	1	1		2			2	3				2	3	3
O6.0CA219E02.2	3	3		2			3	3				2	2	
O6.0CA219E02.3	1	1	3		2		3	3					2	1
O6.0CA219E02.4	1	1	1	2	2		2	3					1	
O6.0CA219E02.5	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)

06.0CA220E02: BLOCKCHAIN ARCHITECTURE

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Fundamentals of Blockchain

Course Type: Domain Elective

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

- O6.0CA220E02.1. Know about introduction to Blockchain.
- O6.0CA220E02.2. Study about consensus protocols.
- O6.0CA220E02.3. Understand Hyperledger fabric.
- O6.0CA220E02.4. Implement of blockchain in financial software system and trade supply chain.
- O6.0CA220E02.5. Design of the use cases.
- CA220E02.6. Design the use cases of blockchain for government.

Unit 1: Introduction to Blockchain

Digital Money to Distributed Ledgers
Design Primitives: Protocols, Security, Consensus, Permissions, Privacy
Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature
Hash chain to Blockchain, Basic consensus mechanisms

Unit 2: Consensus

Requirements for the consensus protocols
Proof of Work (PoW)
Scalability aspects of Blockchain consensus protocols
Permissioned Blockchains: Design goals
Consensus protocols for Permissioned Blockchains

Unit 3: Hyperledger Fabric

Hyperledger Fabric: Decomposing the consensus process
Hyperledger fabric components
Chain code Design and Implementation
Hyperledger Fabric : Beyond Chaincode: Fabric SDK and Front End
Hyperledger composer tool

Unit 4: Implementation

OOPS concept of Python
Encryption technique
Block encryptio
Interface/ API of Blockchain

MRIPRS

Unit 5: Use Case

Use case 1 : Blockchain in Financial Software and Systems (FSS): (i) Settlements, (ii) KYC, (iii) Capital markets.

case 2: Blockchain in trade/supply chain: (i) Provenance of goods, visibility, trade/supply chain finance, invoice management discounting, etc.

Unit 6: Use Case3

Blockchain for Government: (i) Digital identity, land records and other kinds of record keeping between government entities, (ii) public distribution system social welfare systems

Blockchain Cryptography

Privacy and Security on Blockchain

Suggested Readings:

Andreas Antonopoulos, 2014, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, O'Reilly Media.

Melanie Swa, 2015, Blockchain, O'Reilly.

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> (Last visited date: 23rd February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

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(cxiv) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA220E02.1	2		1	2	1		2			1			3	1
O6.0CA220E02.2	1			1			3	1		1	2	1	2	
O6.0CA220E02.3	2		2		1	1			1		2		2	
O6.0CA220E02.4	1		1	2			3	1	3		2		3	2
O6.0CA220E02.5		1	2		3		3	1		3			2	
O6.0CA220E02.6	2			3		2		1			2		3	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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

06.0CA221E02: BLOCKCHAIN AND SMART CONTRACTS

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

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 –

- O6.0CA221E02.1 Make the students familiar with such emerging technologies.
- O6.0CA221E02.2 Understand the cryptographic concept behind the Block chain technology.
- O6.0CA221E02.3. Developing and deploying smart contracts on blockchain platforms like Ethereum
- O6.0CA221E02.4 Understanding of blockchain security principles and best practices for securing smart contracts
- O6.0CA221E02.5 How to integrate blockchain technology into traditional web development practices to create decentralized applications.
- CA221E02.6 Understand and learn the use cases and aspects of Block chain with implementation options.

UNIT 1: Introduction:

Course objectives and outcomes

What is Ethereum? How does Ethereum compare to Bitcoin?

The Ethereum network and History of Ethereum

Background Theories: Cryptographic Hash Functions (SHA), Cryptographically Secured, Digital Signature, Pub lic

Key Cryptography (RSA),

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):

What are Smart Contracts?

What is Ethereum Virtual Machine (EVM)?

What is Decentralized Autonomous Organizations (DAO)?

Quick Start Overview of Remix using JavaScript VM

UNIT 3: Ethereum Technology Overview

Architectural Overview

Ethereum Block chain Platform

Ethereum Virtual Machine

Create your private Ethereum block chain

Download the main Ethereum block chain

Analyze Ethereum block chain

UNIT 4: Introduction to Programming Smart Contracts

A Simple Smart Contract

Account Types, Gas, and Transactions

Contracts

Accessing Contracts and Transactions

Developer Tools and Ethereum Tests

Web3 Base Layer Services

UNIT 5: – Programming Tutorial - Installing, Building, Testing, & Deploying

Ethereum Nodes

Building A Private Blockchain Network
MetaMask Browser Plug In
Mist Browser
Ethereum Wallet
Web3 Ethereum JavaScript API

UNIT 6: Decentralized Apps (Dapps)

Connecting to the Blockchain and Smart Contract
Web3js
Deployment
Sample Web Pages (HTML/CSS/Javascript)

Suggested Books:

Imran Bashir, 2023, Mastering Blockchain, Packt Publishing
Matt Zand, 2021, Hands-On Smart Contract Development with Hyperledger Fabric V2, O'Reilly Media

Note: Only latest editions of the books are recommended.

Web links:

<https://www.geeksforgeeks.org/smart-contracts-in-blockchain/> (Last Visited Date: 21st February, 2024)
<https://www.simplilearn.com/tutorials/aws-tutorial/aws-load-balancer> (Last Visited Date: 21st February, 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cxv) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

Course Articulation Matrix:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA221E02.1	2		1	2	1		2			1			3	1
O6.0CA221E02.2	1			1			3	1		1	2	1	2	
O6.0CA221E02.3	2		2		1	1			1		2		2	
O6.0CA221E02.4	1		1	2			3	1	3		2		3	2
O6.0CA221E02.5		1	2		3		3	1		3			2	
O6.0CA221E02.6	2			3		2		1			2		3	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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

O6.0CA222E02: DEVOPS SOFTWARE ENGINEERING

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Pre-Requisite: Software Engineering

Course Type: Domain Elective

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

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

O6.0CA222E02.1. Apply configuration management to production environments.

O6.0CA222E02.2. Maintain test suites and measure testing quality and coverage

O6.0CA222E02.3. Automatically generate new tests, using feedback-directed random testing, fuzzing, and data-flow analysis

O6.0CA222E02.4. Programmatically measure code quality via static and dynamic code analysis

O6.0CA222E02.5. Describe the principles of DevOps and JIRA tools.

CA222E02.6. Apply advanced strategies for deployment of software.

Unit 1: Introduction to Devops

Introduction to DevOps and importance in Software Development

DevOps and Software Development Life Cycle

Agile Model

Continuous Integration & Deployment

Unit 2: Version Control System

Purpose of Version Control System

Types of Version Control System

Centralized vs Distributed Version Control

Version Control tools

Overview of GIT

Unit 3: Introduction to Agile

Agile methodologies

Agile Requirements

Scaled agile frameworks

Agile forecasting and project Management

Agile tracking tools

Unit 4: Azure DevOps

Azure DevOps Test Plan

Pipelines and artifacts

Introduction of Azure DevOps Server

Build and Publish Image in Azure

Applications for Azure DevOps

Unit 5: Devops Testing Tools

Introduction to Devops Testing Tools

Study of Jira Tool

Install and setup Jira

Project management using Jira
Study of other Devops Software Testing Tools

Unit 6: DevOps on Cloud

Essentials of Cloud computing
Cloud and virtualization architecture
Cloud deployment architecture
Cloud providers – An overview
Why do we need DevOps on Cloud?

Suggested Readings:

Sricharan Vadapalli, 2018, DevOps: Continuous Delivery, Integration, and Deployment with DevOps: Dive, Packt.
Thomas Uphill, John Arundel, Neependra Khare, Hideto Saito, Hui-Chuan, 2017, DevOps: Puppet, Docker, and Kubernetes, Packt.
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.guru99.com/what-is-devops.html> (Last Visited Date: 22 February,2024)
<https://www.geeksforgeeks.org/git-tutorial/> (Last Visited Date: 22 February,2024)
<https://www.geeksforgeeks.org/difference-between-software-engineer-and-devops-engineer/>
(Last Visited Date: 22 February,2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cxvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

Course Articulation Matrix:

CO-PO 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	PSO 1	PSO 2
O6.0CA222E02.1	3	2	2	3	2	1	2	2			1	3	2	2
O6.0CA222E02.2	3	1	1	3	2	1	2	1			2	3	2	2
O6.0CA222E02.3	3	2	1	3	2	1	1	2			2	3	2	2
O6.0CA222E02.4	2	3	2	3	1	1	2	2			3	3	2	2
O6.0CA222E02.5	1	2	1	2	2	1	2	2			3	3	2	2
O6.0CA222E02.6	3	2		2	2	1	1	2			2	3	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

06.0CA223E02: CONTINUOUS INTEGRATION & VERSION CONTROL

Periods/week	Credits	Max. Marks: 100
L: 2	2	Continuous Evaluation: 30
Duration of Examination: 3 Hrs		End Semester Examination: 70

Pre-Requisite: Knowledge of Software Development

Course Type: Domain Elective

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

O6.0CA223E02.1 Define the concept of version control.

O6.0CA223E02.2 Describe working principles of GIT repository and how to use them in real world projects.

O6.0CA223E02.3 Explain workflows and record changes to repository.

CA223E02.4 Make and track changes in a GIT.

O6.0CA223E02.5 create a GIT and use it.

Unit 1: Introduction to Version Controlling Tool

Knowing about Version control
Essentials of GIT in Industry
How to setup GIT
Working with various commands in GIT
Recording Changes to the Repository

Unit 2: Working with GIT

Viewing the Commit History
Undoing Things
Working with Remotes
Branching and Merging in Git
GIT workflows
GIT cheat sheet

Unit-3: Essentials of Continuous Integration (Jenkins)

Essentials of Continuous Integration
An example scenario where CI is used
Know about Jenkins and its architecture in detail
Jenkins tool Management in detail
Know about User management in Jenkins
Authentication
Authorization

Unit 4: Creating jobs and automatic build settings

What is Jenkins Pipeline?
Why Pipeline?
Integration with GIT
How to enable project-based authorization for a job
Source code management while creating jobs

Unit 5: Docker

Real-world Shipping Transportation Challenges
Introducing Docker and its technology
Understanding of Docker images and containers

Working with container
How to Share and copy a container
Container Life Cycle
How to use Base Image and customize
Creation of Docker File
How to Publish Image on Docker Hub

Unit 6: Introduction to Docker Networking

Network Types in docker technology
Docker Container Networking
Docker Compose – An introduction
Docker Swarm – An introduction
Use Docker Compose to create php, wordpress, mysql
How to Start Containers on a Cluster with Docker Swarm
Creating and Scaling an application in Docker swarm

Suggested Readings:

Scott Chacon and Ben Straub, 2021, Pro GIT Everything you need to know about GIT, Apress
Raju Gandhi, 2022, Head First Git: A Learner's Guide to Understanding Git from the Inside Out, Paperback
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 (last visited date: 22 February 2024)

<http://www.w3schools.me/devops/devops-tutorial> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cxix) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxx) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
O6.0CA223E02.1	2		1	1			2						3	3
O6.0CA223E02.2	1	3	1		1		1						2	2
O6.0CA223E02.3	1	2	2	2		2	1						2	3
O6.0CA223E02.4	1	2	2	2	3	2	1						3	2
O6.0CA223E02.5	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)

O6.0CA224E02: NETWORK PROTOCOLS

Periods/week Credits

L: 2 2

Duration of Examination: 3 Hrs

Pre-Requisite: Data Communication & Networking

Course Type: Domain Elective

Max. Marks: 100

Continuous Evaluation: 30

End Semester Examination: 70

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

O6.0CA224E02.1. Learn basics of Network Protocols.

O6.0CA224E02.2. Understand the concepts of different protocols over Data Link layer and MAC layer.

O6.0CA224E02.3. Classify and utilize the details of IP addresses and the functions of different routing protocols. O6.0CA224E02.4. Analyze different protocols require to be configured in networks for reliable transmission.

CA224E02.5. Understand the purpose of application layer services and protocols.

UNIT 1: Network Protocols: Basics and Foundations

Introduction to Network Protocols

Protocols and Standards

Protocol Stack Architecture

Network Protocol Analyzer

TCP/IP Protocol Suite

UNIT 2: Data Link Layer Protocols

Utopian Simplex Protocol

Stop and Wait Protocol for error free and noisy channel

Sliding window protocol

SONET

ADSL

Unit 3: Multiple Access Protocols

ALOHA

CSMA Protocols

Collision free Protocols

Limited Contention Protocols

Wireless LAN Protocols

UNIT 4: Network Layer Protocols

Routing Protocols

Internet Protocol (IPv4 & IPv6)

Internet Control Protocols (ICMP & IGMP)

ARP & RARP

UNIT 5: Transport Layer Protocols

Elements of Transport Protocol

TCP & UDP

Real Time Transport Protocol

Protocol for Long Fat Networks

UNIT 6: Application Layer Protocols

HTTP & HTTPs
SMTP
FTP
DNS
SNMP
Telnet

Suggested Readings:

B. Forouzan, 2017, Data Communication and Networking, Tata McGraw Hill.
A.S. Tanenbaum, 2016, Computer networks, Prentice Hall.
Tomasi Wayne, 2007, Introduction to Data Communication & Networking, Pearson Education
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> (last visited date: 22 February 2024)
www.tutorialspoint.com/listtutorials/networking/1 (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

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O6.0CA224E02.1		2		1		1	3						2	1
O6.0CA224E02.2	2	2	2				3			1			3	2
O6.0CA224E02.3		3		1			2						2	
O6.0CA224E02.4	2	3			1		2		1		1		1	2
O6.0CA224E02.5	2	1	1		2		3			1				

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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06.0CA225E02: TCP/IP

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Computer Networks

Course Type: Domain Elective

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

- O6.0CA225E02.1 Summarize basic principles of IPv4 and its Addressing mechanisms.
- O6.0CA225E02.2 Understand UDP Services and Applications in Transport Layer.
- O6.0CA225E02.3 Describe the services, and features of TCP.
- CA225E02.4 Discuss various Flow, Error and Congestion control mechanisms of TCP.
- O6.0CA225E02.5 Understand the Principles of IPv6 Addressing, IPv6 and ICMPv6 Protocols.

Unit 1: Introduction

The OSI Model and the TCP/IP Protocol Suite
Protocol Layers, The OSI Model, TCP/IP Protocol suite and addressing.
IPv4 Addresses- Introduction, Classful and Classless Addressing
1.4. Internet Protocol Version4(IPv4) – Datagrams, Fragmentation, Options, Checksum, Security, IP Package.

Unit 2: Layers

Introduction to the Transport Layer – Transport Layer Services and Protocols.
User Datagram Protocol (UDP) – Introduction, User Datagram,
UDP Services and Applications,
2.4. UDP Package.

Unit 3: Protocols

Transmission Control Protocol – I: TCP Services, Features
Segment
TCP Connection
Windows in TCP.

Unit 4 Error Control

Transmission Control Protocol – II: Flow Control
Error Control, Congestion Control,
TCP Timers, Options and
TCP Package.

Unit 5: IPv6 Addressing

IPv6 Addressing – Introduction, Address Space Allocation
Global Unicast Addresses, Autoconfiguration and Renumbering.
IPv6 Protocol - Introduction, Packet Format, Transition from IPv4 to IPv6.
ICMPv6 - Introduction, Error Messages, Informational Messages
Neighbor Discovery Messages, Group Membership Messages.

Unit 6: Fragmentation

Internet Protocol: IPv4 - IP Datagram Formats
Data and Fragmentation - Address Masks
Prefixes- and Subnetworks - Network Address Translation (NAT)

Suggested Readings:

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:

http://wwwwdb.deis.unibo.it/courses/TW/DOCS/w3schools/website/web_tcpip.asp.html#gsc.tab=0 (last visited date: 22 February 2024)

<https://www.ibm.com/docs/en/cics-ts/5.3?topic=web-internet-tcpip-http-concepts> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxxiv) For Summative assessment (End Semester Examination or End-Term Examination):

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Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX:

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O6.0CA225E02.2	1	3	1	1			2						2	2
O6.0CA225E02.3	1	2	1	1			2						2	3
O6.0CA225E02.4	1	2	2	3	2		1						3	2
O6.0CA225E02.5	2	1	1	3	2		2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

O6.0CA226E02: 3D MODELS FOR AUGUMENTED & VIRTUAL REALITY

Periods/week

Credits

Max. Marks: 100

L: 2

2

Continuous Evaluation: 30

Duration of Examination: 3 Hrs

End Semester Examination: 70

Pre-Requisite: Computer networks

Course Type: Domain Elective

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

O6.0CA226E02.1. Inculcate conceptual knowledge of 3D modeling and VR

O6.0CA226E02.2. Implement workflows to created 3D content from existing as well as future environments

O6.0CA226E02.3. Hands on practice for 3D model creation using SketchUp, CityEngine (theoretical), Unity

O6.0CA226E02.4. Understand the emerging possibilities of environmentally sensed information

CA226E02.5. Create 3D models and make them accessible in an interactive way through the use of game engines.

UNIT 1: Introduction and Overview of 3D Modeling and Virtual Reality

Distinguishing VR, AR, and MR Systems

3D Modeling and VR in the Geospatial Sciences

Applications of 3D Modeling

An overview of Workflows for 3D Model construction

Static 3D Modeling, Data-Driven Modeling & Procedural Modelling

3D and VR Application Building Workflows

UNIT 2: Hands-on Modeling using SketchUp

Installing SketchUp

Optimization and Rendering

Create a building

SketchUp and Sketchfab

UNIT 3: Introduction to Procedural Modeling & ArcGIS Pro

Overview of procedural modelling

Introduction to CityEngine and its CGA shape Grammar

Create a road map of University park campus

Symbolizes Layers and Edit features

Explore Raster and 3D data

UNIT 4: 3D Spatial Analysis

Overview of 3D spatial Analysis

Flood Analysis

Sun Shadow Volume Analysis

Reflection in Spatial Modeling in 3D

UNIT 5: UNITY I

Overview of UNITY 1

The Unity3D Game Engine

Unity interface and Basic Unity Concepts

Walkthrough: Using Unity to Build a Stand-Alone Windows application

First Game in Unity: Roll-the-Ball

UNIT 6: Unity II

3D Applications in Unity
Walkthrough: From SketchUp Model to Unity
Animations and state change in Unity
Walkthrough: Creating a camera Animation
Unity Based VR Applications for mobile devices
Walkthrough: Creating a 360 degree Movie for Google Cardboard

Suggested Readings:

Kelly S. Hale (Editor), Kay M. Stanney, 2014, Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition (Human Factors and Ergonomics).
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
Jason Jerald, 2015, The VR Book: Human-Centered Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool Publishers.
Tony Parisi, 2015, Learning Virtual Reality, O,Reilly.

Note: Only latest editions of the books are recommended Web

Links:

How to Create 3D Model for Augmented Reality – 3D-Ace Studio (Last visited: 23-02-2024)
How to get started making a video game | Unity (Last visited: 23-02-2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

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Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxxvi) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA226E02.1	1	1	2	2	3		3	2					3	3
O6.0CA226E02.2	1	1	1	1	1		2	2			3		3	3
O6.0CA226E02.3	1	1		1	2		2	2			3		2	3
O6.0CA226E02.4	1		1	1	1		2	1			3		2	2
O6.0CA226E02.5	1	1	1	1			2	2					1	2

MRIR

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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06.0CA227E02: VR AND 360 VIDEO PRODUCTION

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

Max. Marks: 100
Continuous Evaluation: 30
End Semester Examination: 70

Pre-Requisite: Knowledge of Multimedia
Course Type: Domain Elective

Course Outcomes: At the end of the course the student will be able to:
CA227E02.1 Describe how VR systems work and list the applications of VR.
CA227E02.2 Understand the design and implementation of the hardware that enables VR systems to be built.
06.0CA227E02.3 Understand the system of human vision and its implication on perception and rendering.
CA227E02.4 Explain the concepts of motion and tracking in VR systems.
06.0CA227E02.5 Describe the importance of interaction and audio in VR systems.

UNIT 1: Introduction to Virtual Reality

Defining Virtual Reality, History of VR,
Human Physiology and Perception,
Key Elements of Virtual Reality Experience,
Virtual Reality System, Interface to the Virtual World-
Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

Unit 2: The Geometry of Virtual Worlds & The Physiology of Human Vision

Geometric Models,
Changing Position and Orientation,
Axis-Angle Representations of Rotation,
Viewing Transformations,
Chaining the Transformations,
Human Eye, eye movements & implications for VR.

Unit 3: Visual Perception & Rendering

Visual Perception –
Perception of Depth, Perception of Motion,
Perception of Color, Combining Sources of Information
Visual Rendering -Ray Tracing and Shading Models,
Rasterization, Correcting Optical Distortions,
Improving Latency and Frame Rates

Unit 4: Motion & Tracking

Motion in Real and Virtual Worlds-
Velocities and Accelerations, The Vestibular System,
Physics in the Virtual World, Mismatched Motion and Vection Tracking-
Tracking 2D & 3D Orientation,
Tracking Position and Orientation, Tracking Attached Bodies

UNIT 5: Interaction & Audio

MRIPS

Locomotion, Manipulation, Social Interaction. Audio –
The Physics of Sound,
The Physiology of Human Hearing,
Auditory Perception, Auditory Rendering.

Unit 6: 360 Video

What is 360 Video?,
3-DoF vs 6-DoF, Position and Orientation,
Agency, Presence, and Immersion,
Point of View (POV),
Mono vs. Stereo, Parallax, Equirectangular Projection & Cubemaps,
Field of View (FOV), Stitch Lines

Suggested Readings:

Steven M. LaValle, 2016, Virtual Reality, Cambridge University Press.
William R Sherman and Alan B Craig, 2002, Understanding Virtual Reality: Interface, Application and Design, Morgan Kaufmann Publishers.
Alan B Craig, William R Sherman and Jeffrey D Will 2009, Developing Virtual Reality Applications: Foundations of Effective Design, , Morgan Kaufmann.
Gerard Jounghyun Kim, 2005, "Designing Virtual Systems: The Structured Approach, Springer.
Doug A Bowman, Ernest Kujiff, Joseph J LaViola, Jr and Ivan Poupyrev, 2005, "3D User Interfaces, Theory and Practice", Addison Wesley
Oliver Bimber and Ramesh Raskar, 2005, "Spatial Augmented Reality: Merging Real and Virtual Worlds, Routledge.
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> (last visited date: 22 February 2024)

Instructions for paper setting: Seven questions are to be set in total. First question will be multiple choice covering entire syllabus and will be compulsory to attempt and will be of 18 marks. 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 13 marks.

Evaluation Policy:

The evaluation will include two types of assessments:

(cxxvii) Continuous or formative assessments (in the form of end semester examination or term examination. Weightage of assessments are as follows:

For continuous or Formative assessment (in semester): Maximum 30 percent. The categorization for the same is:

MCQs	30%
Subjective (Short/Long)	40%
Discussion/Presentation	15%
Projects/Group Activities etc	15%

(cxxviii) For Summative assessment (End Semester Examination or End-Term Examination):

Minimum: 70 percent. Categorization for the same is:

Objective Type Questions:	30%
Short/Long Questions:	70%

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

CO-PO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
O6.0CA227E02.1	3	1	2	2	3		2						3	1
O6.0CA227E02.2	1	1	2	3	1		2						3	1
O6.0CA227E02.3	2	2	2	1	1								2	1
O6.0CA227E02.4	1	1	2	1	1		3						1	2
O6.0CA227E02.5	2	2	2	1			2	3					2	2

MRIPS