MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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

FACULTY OF COMPUTER APPLICATIONS

DEPARTMENT OF COMPUTER APPLICATIONS

CURRICULUM

AND

SCHEME OF EXAMINATION

(MASTER OF COMPUTER APPLICATIONS)

BATCH: 2022-2024

FOREWORD

This is to certify that this booklet contains the entire Curriculum and Scheme of Examination of Master of Computer Applications being offered at Faculty of Computer Applications of this University. This has been duly vetted and finally approved by the Academic Council of the University vide its 40th meeting held on 10-05-2022 and changes, if any deemed appropriate, shall be duly incorporated after the necessary approval by the Academic Council.

This Curriculum and Scheme of Examination of Master of Computer Applications shall be implemented w.e.f. AY 2022-24.

Date: **Dean-Academics, MRIIRS**

PREAMBLE

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

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

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

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

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

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

INDEX

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FACULTY OF COMPUTER APPLICATIONS

DEPARTMENT OF COMPUTER APPLICATIONS

VISION AND MISSION

VISION

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

MISSION

1. To impart theoretical and practical training in advanced areas of computer applications and contribute new knowledge through analytical learning which encourages creativity, insight development and a passion for information technology.

2. To provide better ambience for research in order to enhance the performance of faculty members and scholars while continually providing conducive teaching- leaning and research environment.

3. To provide learning ambience to generate innovative and problem solving skills with professionalism.

ABOUT THE DEPARTMENT

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

PROGRAM EDUCATION OBJECTIVES (PEOs)

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

development and exposure to the latest software tools and techniques to develop the applications. Following are Program Educational Objectives of MCA:

PEO 1. To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms in the field of Computer Applications.

PEO 2. To provide students a solid foundation in computing fundamentals and techniques required to solve related problems and also to pursue higher studies and research.

PEO 3. To inculcate students in professional and ethical attitude, effective communication skills, multidisciplinary approach and an ability to relate computing issues to broader social context.

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

PROGRAM SPECIFIC OBJECTIVES & PROGRAM OUTCOMES

PROGRAM SPECIFIC OBJECTIVES (PSO):

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

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

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

PROGRAM OUTCOMES (POs)

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

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

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

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

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

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

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

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

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

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

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

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

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

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	**3,4**

	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	**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**

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 fulfillment 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 63 credits** required to be earned under **"Compulsory Courses Basket"** and **17 credits** under **"Elective Courses Basket".**

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

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

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

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under "Elective Courses Basket" depending upon his/her interest, capability/pace of

learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the "Elective Courses Basket" during the entire programme duration.

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

SEMESTER WISE STUDY SCHEME WITH CONTACT HOURS, ASSIGNED CREDITS & DISTRIBUTION OF MARKS

SEMESTER- I													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Ex-am**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Int**	**Ext**	**Total**		
Compulsory Courses													
Fundamentals	MCA-RIC-I	Research Innovation Catalyst-I	NA	NA		1		1	50		50		0.5
Fundamentals	MCA-DS-301	Linear Algebra and Statistical Techniques	Mathematics for Computing	MCA-DS-104	3	1		4	100	100	200	3	4
Core	MCA-DS-302	Data Structures	Programming in C	MCA-DS-102	3			3	100	100	200	3	3
Core	MCA-DS-303	Object Oriented Programming in Java	Programming in C++	MCA-DS-201	3			3	100	100	200	3	3
Core	MCA-DS-352	Data Structures Lab	Programming in C Lab	MCA-DS-152			2	2	50	50	100	3	1
Core	MCA-DS-353	Object Oriented Programming in Java Lab	Programming in C++ Lab	MCA-DS-251			2	2	50	50	100	3	1
Core	MCA-DS-357	Python Programming Lab	NA	NA			2	2	50	50	100	3	1
Domain Specific (Elective)	MCA-DS-304	Computer Graphics	NA	NA	3			3	100	100	200	3	3
	MCA-DS-305	Web Applications Development using PHP	Database Systems	MCA-DS-204									
	MCA-DS-306	Multimedia and Animation	NA	NA									
Domain Specific (Elective)	MCA-DS-355	Web Applications Development using PHP Lab	Database Systems Lab	MCA-DS-254			2	2	50	50	100	3	1
	MCA-DS-354	Computer Graphics Lab	NA	NA									
	MCA-DS-356	Multimedia and Animation Lab	NA	NA									
Bridge Course	MCA-DS-001	Fundamentals of Computer Programming			2				100	100	200	3	Audit Pass***
	MCA-DS-002	Elements of Mathematics			2				100	100	200	3	Audit Pass***
Total													17.5

*** Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.**

*****The students from non-technical background are required to pass these subjects which are non-creditable courses.**

SEMESTER- II

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int	Ext	Total		
Compulsory Courses													
Fundamentals	MCA-RIC-II	Research Innovation Catalyst-II	Research Innovation Catalyst-I	MCA-RIC-I		1		1	50		50	-	0.5
Core	MCA-DS-402	Data Communications	NA	NA	3			3	100	100	200	3	3
Core	MCA-DS-403	Analysis & Design of Algorithm	Data Structures	MCA-DS-302	3			3	100	100	200	3	3
Core	MCA-DS-404	Artificial Intelligence	Data Structures	MCA-DS-302	3			3	100	100	200	3	3
Core	MCA-DS-451	Android Application Development Lab	Java Lab	MCA-DS-353			4	4	50	50	100	3	2
Core	MCA-DS-452	R Programming Lab	Programming in C	MCA-DS-102			4	4	50	50	100	3	2
Core	MCA-DS-453	Vocational Training	NA	NA	4 Week				100		100	2	2
Super Speciality	MCA-ID-001	Employability Skills Enhancement	NA	NA	2			2	50	50	100	2	2
Domain Specific (Elective)		Elective I			2			2	100	100	200	3	2
Total													**19.5**

*** Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.**

Elective I:

Course Code	Course Name
MCA-DS-405	Cyber Security
MCA-DS-406	Mobile Computing
MCA-DS-407	System Programming
* MCA-ED-401	Azure Data Fundamentals
**MCA-EA-401	Azure AI Fundamentals
***MCA-EC-401	Azure Fundamentals

SEMESTER- III													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Int**	**Ext**	**Total**		
Compulsory Courses													
Fundamentals	MCA-RIC-III	Research Innovation Catalyst-III	Research Innovation Catalyst-II	MCA-RIC-II			2	2	100		100		1
Core	MCA-DS-502	Advance Database Systems	Database Systems	MCA-DS-204	3			3	100	100	200	3	3
Core	MCA-DS-503	Programming in .NET	Programming in C++	MCA-DS-201	3			3	100	100	200	3	3
Core	MCA-DS-504	Software Engineering & Testing	NA	NA	3			3	100	100	200	3	3
Core	MCA-DS-552	Advance Database Systems Lab	Database Systems Lab	MCA-DS-254			4	4	50	50	100	3	2
Core	MCA-DS-553	. NET Lab	Programming in C++ Lab	MCA-DS-251			4	4	50	50	100	3	2
Domain Specific Elective	MCA-DS-505	Big Data Analytics	NA	NA	3			3	100	100	200	3	3
	MCA-DS-506	Cloud Computing	Data Communications	MCA-DS-402									
Domain Specific Elective	MCA-DS-555	Big Data Analytics Lab	NA	NA			2	2	50	50	100	3	1
	MCA-DS-556	Cloud Computing Lab	NA	NA									
Domain Specific Elective		Elective II			2			2	100	100	200	3	2
Total													**20**

*** Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.**

Elective-II

Course Code	Course Name
MCA-DS-507	Network Security and Cryptography
MCA-DS-508	Database Administration
MCA-DS-509	E-Commerce Technologies
*MCA-ED-501	Azure Database Administrator Associate
**MCA-EA-501	Azure Developer Associate
***MCA-EC-401	Security operations Analyst Associate

SEMESTER- IV													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Int**	**Ext**	**Total**		
Compulsory Courses													
Core	MCA-DS-601	Advance Java	Object Oriented Programming in Java	MCA-DS-303	3			3	100	100	200	3	3
Core	MCA-DS-602	Software Project Management	NA	NA	3	1		4	100	100	200	3	4
Core	MCA-DS-651	Advance Java Lab	Java Lab	MCA-DS-353			4	4	50	50	100	3	2
Core	MCA-DS-652	Project	NA	NA			18	18	300	200	500	2	9
Domain Elective		Elective III			2			2	100	100	200	3	2
Total													**20**
OR													
Core	MCA-DS-653	Major Project	NA	NA	20-22 Week Industrial Training			-	600	300	900	-	20

Elective-III

Course Code	Course Name
MCA-DS-603	Data Mining & Warehousing
*MCA-ED-601	Azure Data Engineer Associate
**MCA-EA-601	Azure AI Engineer Associate
***MCA-EC-601	Azure Security Engineer Associate

Note: (a) * indicates Data Science and Big data Analytics

(b) ** indicates Artificial Intelligence and Machine Learning

(c) * indicates Cyber Security**

*** Under Elective Courses, beside the mentioned Domain Specific Elective Courses, other Inter-disciplinary, Generic, on-line Courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per maximum limit for maximum credits and for the category of Elective Courses under University Rules.**

****For Successful completion of the MCA degree, the students need to earn 63 credits of compulsory courses and at least 17 of Elective Courses.**

SEMESTER-I

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MCA-RIC-I: RESEARCH INNOVATION CATALYST-I

Periods/week	Credits	Max. Marks: 50
T: 1	0.5	Continuous Evaluation: 50
		End Semester Examination: Nil

Pre-requisites: Basic knowledge of Research and Innovation

Course Type: Research & Training

Course Outcomes:

MCA-RIC.I.1. The students will be able to understand what is Research and Innovation.
MCA-RIC.I.2. To be in a position to describe the process and the procedure to carry out research/ innovation
MCA-RIC.I.3. To understand the research documentation that is needed for, journals publication, conferences etc.
MCA-RIC.I.4.To understand and adopt the ethical practice in the research / Innovation activities.
MCA-RIC.I.5. To comprehend the benefits obtained by means of systematic research/ Innovation
MCA-RIC.I.6. To inculcate Team building and collaborative approach.

Unit 1: What is Research?

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

Unit 2: Insight about Scientific Documentation

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

Unit 3: Understanding the Literature Survey (LS)

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

Unit 4: Implementation of Process

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

Unit 5: Report Writing and Presentation skill Development

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

References:

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

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

Criteria	Evaluation parameters	Weightage (Marks)	
Online and offline Attendance	· Percentage of classes attended by the students	3+2	5
Group participation and response of the students to a given task	· Judge individual student in the group · Meeting timelines as per lesson plan	5 10	15
Selection of research/ Innovation topics and Literature Survey	· Student interaction with faculty mentors · Relevance of the topic · Usage of Scientific Literature Databases. e.g., Scopus/ Web of Science/ etc. · Scientific/Technical writing · Number of relevant papers referred for the given topic	3 2 1 2 2	10

Presentation and Report Making	▪ Report structure and Slide sequence, ▪ Contribution of individual group member towards the presentation and report ▪ Reference listing ▪ Plagiarism/Authenticity of the report	5 5 5 5	20

Course Articulation Matrix:

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

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MCA-DS-301: LINEAR ALGEBRA AND STATISTICAL TECHNIQUES

Periods/week	Credits
L: 3 T: 1	4
Duration of Examination: 3 Hrs	

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

Pre-Requisite: Knowledge of basic mathematics
Course Type: Fundamentals

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

MCA-DS-301.1. Learn the concepts and methods of Linear Algebra.
MCA-DS-301.2. Interpret the ability to solve problems using Linear Algebra.
MCA-DS-301.3. Relate Linear Algebra to other domain of study.
MCA-DS-301.4. Examine the impact of Skewness and outliers on the various statistical interpretations.
MCA-DS-301.5. Develop critical reasoning by studying statistical concepts
MCA-DS-301.6. 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 Clayey-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 $\chi 2$ - Distribution

Unit 6: **Linear Programming & Transportation**
6.1 Linear Programming
6.2 Graphical Method to solve LPP
6.3 Simplex Method
6.4 Artificial variables and degeneracy in Simplex Method
6.4 Transportation Problems and their optimal basic solutions
6.5 Unbalanced Transportation Problems.

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-301.1	1		1	2	2		3						3	1
MCA-DS-301.2	1	1	2	3	1		2						3	1
MCA-DS-301.3	1	2	2	1	2								2	1
MCA-DS-301.4	1	1	2	1	1		3						1	2
MCA-DS-301.5	1	1	2	1			2	3					2	2
MCA-DS-301.6	1	1	2	1	1		2	2				3	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-302: DATA STRUCTURES

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Basic concepts of C Programming
Course Type: Core

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

MCA-DS-302.1. Describe the concept to evaluate asymptotic performance of algorithms.
MCA-DS-302.2. Develop skills to design and analyze simple linear and non linear data structures.
MCA-DS-302.3.Apply for solving problem like traversing, searching, sorting, insertion and deletion of data.
MCA-DS-302.4. Demonstrate linear and non linear data structures in real life problems.
MCA-DS-302.5 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
5.2Types of Graphs
5.3 Sequential and Linked Representation of Graphs
5.4 Traversing a Graph: BFS; DFS
5.5 Minimum Spanning Tree
5.6 Graph Operations
5.7 Shortest path Algorithms: Dijkstra's and Warshall's Algorithm

Unit 6: File Organization
6.1 Introduction to File Organization
6.2 File attributes and operations
6.3 Fixed and Variable Length Record
6.4 Hashing Techniques
6.5 Collision Resolution Techniques

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

Software required/ Weblinks:
Turbo C
https://www.tutorialspoint.com/data_structures_algorithms/index.htm
http://toolsqa.com/data-structures-tutorial/

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-302.1	1	1	2	2	3		3	2					3	3
MCA-DS-302.2	1	1	1	1	1		2	2			3		3	3
MCA-DS-302.3	1	1	1	1	2		2	2			3		2	3
MCA-DS-302.4	1	1	1	1	1		2	1			3		2	2
MCA-DS-302.5	1	1	1	1			2	2					1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-303: OBJECT ORIENTED PROGRAMMING IN JAVA

Periods/week	Credits	Max. Marks : 200
L: 3	3	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of C++ Programming
Course Type: Core

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

MCA-DS-303.1. Understand the Object-oriented concepts of modern programming language.
MCA-DS-303.2. Identify classes, objects, functions and relationships among them needed for a specific problem.
MCA-DS-303.3. Use Java in a variety of technologies and on different platforms.
MCA-DS-303.4. Demonstrate the concepts of Polymorphism and Inheritance.
MCA-DS-303.5. Design solutions of basic problems using Object-oriented approach.
MCA-DS-303.6. 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
2.8Types of Inheritance in Java; deriving classes using extends keyword
2.9 Overriding Methods: Super keyword, Final keyword
2.10Abstract Classes; Shadowing vs overriding

UNIT 3: Interfaces and Packages

3.1Interfaces: 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
4.6Creating a thread
4.7 Thread Life-Cycle
4.8Thread Priorities
4.9 Synchronizing Threads

UNIT 5: Applet Programming and Introduction to Event Handling

5.1Two types of Applets: Applet & Application
5.2Applet Life Cycle
5.3 How to run an applet?
5.4Passing 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
6.2Components and Containers
6.3 AWT Controls
6.4Introduction to JDBC: Load the driver; establish connection; create statement; execute query; iterate resultset, transactions

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

Software required/Web links:

JDK 1.8
https://www.tutorialspoint.com/java/index.htm
https://www.javatpoint.com/java-tutorial

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-303.1	2	2		3	1								2	3
MCA-DS-303.2	2	1		3	2									3
MCA-DS-303.3	2	2	1	3				1						3
MCA-DS-303.4	3	3	1	2				1					2	2
MCA-DS-303.5	2	2	1	2				1			3			3
MCA-DS-303.6	3	2	1	2			1							3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-304: COMPUTER GRAPHICS

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Evaluation : 100
Duration of Examination: 3 Hrs		End Semester Examination : 100

Pre-requisite: Basic mathematics including familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
Course Type: Domain Specific

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

MCA-DS-304.1: Describe the basic concepts of computer graphics and its applications in day to day life.
MCA-DS-304.2: Summarize and interpret the various categories of graphics algorithms.
MCA-DS-304.3: Apply various scan conversion algorithms on real life problems.
MCA-DS-304.4: Apply effective editing by using different transformations on 2D and 3D objects.
MCA-DS-304.5: Categorize the different object shapes and their detection methods in 2D and 3D viewing.
MCA-DS-304.6: Demonstrate practical applications on computer graphics to continue professional development.

PART-A

UNIT 1: Introduction to Computer Graphics
1.1 Basic concepts of Computer Graphics
1.2 Computer graphics hardware, Software and Standards
1.3 User Interface: Console User Interface (CUI) and Graphical User Interface (GUI)
1.4 Application of Computer Graphics
1.5 Input – Output Devices
1.6 Cathode Ray Tube
1.7 Color Monitors
1.8 Flat Panel Devices
1.9 Direct View Storage Tube
1.10 Frame Buffer
1.11 Display Processor

UNIT 2: Scan Conversion
2.1 Scan Conversion of Point, Line, and Circle
2.2 Line Drawing Algorithm: Slope Intercept, DDA and Bresenham's
2.3 Circle Drawing Algorithm s: Mid Point, Bresenham's
2.4 Ellipse Drawing Algorithm
2.5 Antialiasing

UNIT 3: Curve drawing and Polygon filling Algorithms
3.1 Introduction to Curve Hierarchy
3.1 Bezier Curve
3.2 B-spline Curve
3.3 Area Fill Attributes: Fill style, Pattern Fill, Soft fills
3.4 Solid Modelling Techniques: Sweep Representation, Constructive Solid Geometry, Octtree, BSP Tree
3.4 Filling of Curved Boundary: Boundary fill algorithm, Flood fill algorithm.
3.5 Character Generation

PART-B

UNIT 4: Transformation & Projection

4.1 Two Dimensional and Three-Dimensional graphics concepts
4.2 Introduction to basic Matrix Operation
4.3 2-D transformation: Translation; Scaling; Rotation; Reflection, Shearing.
4.4 Composite transformations
4.5 3-D Transformation: Translation; Scaling; Rotation.
4.6 Numerical Implementation of 2D and 3D Transformation
4.7 Introduction to Projection
4.8 Types of projections : Parallel & Perspective

UNIT 5: Clipping

5.1 Introduction to Window and Viewport
5.2 Viewing pipeline
5.3 Viewing Coordinate Reference Frame
5.4 Window to Viewport mapping
5.5 Introduction to Clipping
5.6 Point Clipping Algorithm
5.7 Line Clipping Algorithms: Cohen Sutherland, Liang Barsky
5.8 Polygon Clipping Algorithm: Sutherland-Hodgeman, Weiler Antherton

UNIT 6: Visible Surface Detection Methods

6.1 Concept of Hidden Line & Surfaces
6.2 Classification of Visible Surface Detection Algorithm
6.3 Back Face Detection
6.4 Depth Buffer Method
6.5 Depth Sorting Method
6.6 Wireframe Methods
6.7 Visibility Detection Functions

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

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

Distribution of Continuous Evaluation Table:

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

Class performance	10%
Attendance	10%

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-304.1		2				1	2	1	1	1	1		2	2
MCA-DS-304.2	2		1			1	2	1	1	1	2		1	1
MCA-DS-304.3	2		1			1	2	1	1	1	2		1	3
MCA-DS-304.4	2		1			1	2	1	1	1	2		1	3
MCA-DS-304.5	2	2		2	2	1	2	2	2	1	2		2	2
MCA-DS-304.6	2					1	1	1	1	1	1	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-305: WEB APPLICATION DEVELOPMENT USING PHP

Periods/week	Credits	Max. Marks: 200
L: 3	3	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of Programming Languages and Database Management System
Course Type: Domain Specific

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

MCA-DS-305.1. Learn basics of Web Programming.
MCA-DS-305 2. Understand the concepts of different frameworks for website designing.
MCA-DS-305.3. Apply different tools and run commands for developing interactive website.
MCA-DS-305.4. Analyze the interface and make connectivity with database.
MCA-DS-305.5. Create and design website using PHP and MySql.

.PART –A

UNIT 1: HTML Basics
1.1 Principals involved in developing website
1.2 Five golden rules of web designing
1.3 Web Standards
1.4 Introduction to HTML
1.5 Basic Structure of HTML document
1.6 HTML Tags
1.7 Content layout and presentation
1.8 Working with images
1.9 Working with Lists
1.10 Table Handling
1.11 Frame Design
1.12 Form Design

UNIT 2: Introduction to Cascading Style Sheets and JavaScript
2.1 Introduction to Cascading Style Sheet
2.2 CSS Properties
2.3 Internal Style sheets
2.4 External Style sheets
2.5 Inline Style sheets
2.6 CSS ID and Class
2.7 Introduction to JavaScript: Document Object Model
2.8 JavaScript identifiers
2.9 JavaScript Operators
2.10 Control & Looping structure
2.11 Creating Dialog Boxes

Unit 3: Hypertext Preprocessor (PHP) Concepts
3.1 Introduction to PHP
3.2 PHP history and importance

3.3 Variables and Constants in PHP
3.4 Data types in PHP
3.5 Operators in PHP
3.6 Conditional statements
3.7 Loops
3.8 Date and Time and Image uploading in PHP
3.9 Creating and accessing string
3.10 String functions
3.11 Working with PHP forms: Get and Post methods
3.12 Form Validation
3.13 Session Handling

PART-B

UNIT 4: Working with Arrays and Files
4.1 Concept of Arrays
4.2 Types of Arrays: Index based arrays and Associative Arrays
4.3 Accessing Arrays
4.4 Single dimensional Arrays
4.5 Multidimensional array
4.6 Opening and Closing of File
4.7 Introduction to Objects
4.8 Copying, renaming and deleting of file
4.9 Working with directories
4.10 Building text editor
4.11 File uploading and downloading

UNIT 5: Object Oriented Programming in PHP
5.1 Declaring a class
5.2 The new keyword and constructor
5.3 Destructor
5.4 Access method and properties using $this variable
5.5 Public, private, protected properties and methods
5.6 Inheritance
5.7 Polymorphism
5.8 Exception Handling: Understanding Exception and error
5.9 Try, catch, and throw

UNIT 6: Connection with MySql Database and Introduction to Frameworks
6.1 Introduction to MySQL
6.2 Performing basic database operation (DML): Insert, Delete, Update, Select from PHP Scripts
6.3 Executing parameterized query
6.4 Joins: Cross joins, Inner joins, Outer Joins, Self joins
6.5 Storing and retrieving data from MySQL DB using PHP based forms
6.6 Sending Email using PHP form
6.7 Introduction to Frameworks (Word Press)

Suggested Readings:

1. Ivan Bayross, 2010, HTML, DHTML, PERL, CGI, BPB Publications.
2. Mike McGrath, 2012, PHP and MySQL, Tata McGraw Hill
3. Lynn Beighley, 2008, Head First PHP & MySQL, O'Reilly Media
4. W.Jason Gilmore, 2010, Beginning PHP and MySQL from Novice to Professional, Apress.

5. Luke Welling Laura Thomson, 2016, PHP and MySql web Development, Addison-Wesley Professional

Note: Only latest editions of the books are recommended

Software required/ Web links:

Web Server: Apache HTTP Server 2.2
Database Server: MySql Server 5.0
https://www.phptpoint.com/software-requirement/
https://www.javatpoint.com/php-tutorial

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

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-305.1	3	2	1			2							2	2
MCA-DS-305.2		1		1			1	1	1	2			1	1
MCA-DS-305.3		3							1				1	3
MCA-DS-305.4		3						1					1	3
MCA-DS-305.5		3	3	2	2	1	1	1		1			2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-306: MULTIMEDIA AND ANIMATION

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite:None
Course Type: Domain Specific

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

MCA-DS-306.1. State the present scenario and technological development of multimedia and its databases.
MCA-DS-306.2. Classify the role played by different team members in the process of making impressive multimedia.
MCA-DS-306.3. Implement an interactive multimedia application using multimedia authoring tool.
MCA-DS-306.4. Experiment effective editing in different multimedia elements by using different softwares.
MCA-DS-306.5. Select different attributes of an object and scene and develop a 2D animation.
MCA-DS-306.6. Visualize and design 3D objects and animate using Blender.

PART – A

UNIT 1: Multimedia System Design: An Introduction
1.1 Fundamentals of Multimedia
1.2 Multimedia Applications and System Architecture
1.3 Evolving Technologies for Multimedia Systems
1.4 Multimedia Databases
1.5 Web Publishing & Graphics

UNIT 2: Enhancing Multimedia Skills
2.1 The stages of Multimedia Project
2.2 Hardware and Software requirements
2.3 Authoring Systems
2.4 Team for Multimedia Development
2.5 The Internet and Multimedia

UNIT 3: Introduction to Image Editing by Adobe Photoshop
3.1 Getting to Know the Work Area
3.2 Basic Photo Corrections
3.3 Working with Selections
3.4 Layer Basics
3.5 Correcting and Enhancing Digital Photographs
3.6 Masks and Channels
3.7 Typographic Design and Vector Drawing Techniques
3.8 Advanced Compositing
3.9 Preparing Files for the Web

PART – B

UNIT 4: Introduction to 2D Animation using Macromedia Flash

4.1: Introduction to Macromedia Flash
4.2: Creating Artwork and Adding Sound
4.3: The Macromedia Flash 5 Interface
4.4: Basic Drawing in Macromedia Flash 5
4.5: More Drawing, Using Text, Working with Layers, and Importing Artwork
4.6: Symbols, the Macromedia Flash Library, and the Movie Explorer
4.7: Animation
4.8: Using Sound
4.9: Adding Interactivity
4.10: Publishing and Exporting Your Macromedia Flash Movies

UNIT 5: 3D Design using Blender software
5.1 Introduction to Visual Effects and Blender
5.2 3D: General Principles
5.3 Downloading, Installing, and Setting Up Blender
5.4 Making and Rendering Scenes
5.5 Editing Objects : Separating and Joining Objects
5.6 Object Modifiers, Converting to Mesh from Curve
5.7 Texturing, Principles, Rendering in Cycles
5.8 Three-Point Lighting Setup, Advanced Textures, Camera Effects and Properties
5.9 Cycles Renderer and Its Settings
5.10 Preparation for Sculpting
5.11 Baking, Retopologizing
5.12 Compositing :Breakdown of a Scene, Buildup of a Scene
5.13 Color Correction and Texture Editing
5.14 Sweetening and VFX
5.15 Animation of Characters :The Armature, Bones, Poses and Keyframes

UNIT 6: Introduction to Multimedia Database Design and Security
6.1 Design and Architecture of a Multimedia Database
6.2 Organizing Multimedia DataBase
6.3 Securing Multimedia Data: encryption, Watermarking
6.4 Digital Rights Management Systems
6.5 Security Attacks

Text / Reference Books:
1. Tay Vaughan, 2011, Multimedia making it works, TMH
2. Chun-Shien Lu, 2004, Multimedia Security: Steganography and Digital Watermarking techniques for Protection of Intellectual Property, Springer
3. Sinclair, 2008, Multimedia on the PC, BPB
4. Subramanian V. S., 2013, Principles of Multimedia Database Systems, Elsevier Publishers.

Note: Only latest editions of the books are recommended.

Software required:
Adobe Photoshop CS6
Macromedia Flash 8
Open Source Blender

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one

from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-306.1.			1		1		3		2	1	1		3	2
MCA-DS-306.2.					1		1	2	3	1	1		3	2
MCA-DS-306.3.					1		1	2	2	2	2		2	3
MCA-DS-306.4.		1	2		1		1	2	2	2	2		2	3
MCA-DS-306.5.		1	2		1		1	2	3	2	2		1	
MCA-DS-306.6.	3	1	2		1		1	2	2	2	2			1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-354: COMPUTER GRAPHICS LAB

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

Co-Requisite: Programming in C language
Course Type: Domain Specific

Course Outcomes:

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

MCA-DS-354.1: Understand basics of computer graphics, different graphics devices and application of computer graphics.

MCA-DS-354.2: Use various scan conversion and object filling algorithm and their comparative analysis.

MCA-DS-354.3: Use geometric transformations on graphics objects and their application in composite form.

MCA-DS-354.4: Extract scene with different clipping methods and its transformation to graphics display devices.

MCA-DS-354.5: Explore projections and visible surface detection technique for display of 3D scene on 2D screen.

List of Practical:

1. Write a Program to draw a grid.
2. Write a Program to draw a clock.
3. Write a Program to draw an animation car.
4. Write a Program to draw the hut.
5. Write a Program to draw a line using DDA algorithm.
6. Write a Program to draw a nest with eggs.
7. Write a Program to draw the joker.
8. Write a Program to draw an ellipse using mid point algorithm.
9. Write a Program to draw a kite.
10. Write a Program to draw a line using Bresenhams line drawing algorithm.
11. Write a Program to draw a circle using mid point circle algorithm.
12. Write a Program to draw a cuboid.
13. Write a Program to draw a smiley.
14. Write a Program to draw a computer system.
15. Write a Program to draw a star using line statement.
16. Write a Program to generate a tree.
17. Write a Program to generate pixel at random location with random colors.
18. Write a Program to create concentric circle.
19. Write a Program to generate concentric rectangle.
20. Write a Program to design scenery.
21. Write a Program to design a solar system.
22. Write a Program to design a chess board.
23. Write a Program to design a moving fan.
24. Write a Program to rotate a triangle A(1,1) , b(5,2) and C(7,9) with an angle of 90 degree.
25. Write a Program to translate a rectangle A(1,1) , b(5,1) ,C(1,7) and D(5,7) by 3 unit in x direction and 4 units in y direction.

26. Write a Program to rotate a unit cube with an angle of 60 degree.
27. Write a Program to translate a cuboid whose length is 4 units, breadth is 5 units and height is 3 units uniformly by 3 units.
28. Write a program to find the mirror refection of a unit cube.

Suggested Readings:

1. Tay Vaughan, 2011, Multimedia making it works, TMH
2. Chun-Shien Lu, 2004, Multimedia Security: Steganography and Digital Watermarking techniques for Protection of Intellectual Property, Springer
3. Sinclair, 2008, Multimedia on the PC, BPB
4. Subramanian V. S., 2013, Principles of Multimedia Database Systems, Elsevier Publishers.

Software required:

Turbo C compiler

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-354.1	3				1	1	2						1	1
MCA-DS-354.2		2	2		2	2	2				2		3	2
MCA-DS-354.3	2	2		1		1	1	1	1		2		3	3
MCA-DS-354.4	2	2				1	1	1	1		1	1	3	2
MCA-DS-354.5	1	1				1	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)

MCA-DS-355: WEB APPLICATIONS DEVELOPMENT USING PHP LAB

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

Co-Requisite: PHP Programming & MySQL Database
Course Type: Domain Specific

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

MCA-DS-355.1. Implement interactive webpages using HTML, CSS and Javascript.
MCA-DS-355.2. Design responsive website HTML and CSS.
MCA-DS-355.3. Apply graphics on a web page.
MCA-DS-355.4. Develop a dynamic website/application using server side PHP and database connectivity with MySQL

List of Practical:

HTML, CSS and JavaScript

1. Write HTML Code to demonstrate the use of Anchor Tag for the Following:-
    a. Creating a web link that opens in a new window.
    b. Creating a web link that opens in the same window.
    c. "Reference within the same html document
    d. "Reference to some image
    e. Making an image a hyperlink to display second image.
2. Create a website in which all the hyperlinks are the list items of an unordered list. The arrange the list in a frame that lies in left side of home page and after clicking the hyperlink the corresponding details should be displayed in a frame in right side of the webpage.
3. Prints 10 names with a line break between each name. The list should be alphabetized, and to do this place a subscripted number next to each name based on where it will go in the alphabetized list.
4. Display five different images. Skip two lines between each image. Each image should have a title.
5. Print a long quote and a short quote. Cite the author of each quote.
6. Create an HTML page named exer1.html with an embedded style sheet with the following properties:
    a. Paragraph text is set to the color red, has a font-size of 14 pixels (px), and is of font-family arial.
    b. Heading (h1) is set to the color "#660000", has a font-size of 24 points (pt), is of font-family arial, and has the property text-align set to center.
    c. Display an image that has a border of size 2, a width of 200, and a height of 200.
7. Print first, the unalphabetized list with a subscript number next to each name, then the alphabetized list. Both lists should have an <h1> level heading
8. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.
9. To create an html file by applying the different styles using inline, external & internal style sheets.
10. Use user defined function to get array of values and sort them in ascending order

11. Demonstrate String and Math Object's predefined methods
12. Write a program in JavaScript to swap images using mouse over () event
13. Write a program to generate mark sheet in JavaScript using forms and methods
14. Design a webpage of student database using alert(),confirm() and prompt() dialog boxes

PHP & MySQL

15. Write a PHP program to check if a given positive integer is a power of two, three and four.
16. Write a PHP program to check if an integer is the power of another integer.
17. Write a while loop in your PHP code to output the numbers 10 to 30. Then try to change the loop to output numbers 20 to 1,in reverse order
18. Write a PHP program to find a missing number(s) from an array
19. Write a PHP program to find three numbers from an array such that the sum of three consecutive numbers equal to zero.
20. Write a PHP program to find three numbers from an array such that the sum of three consecutive numbers equal to a given number
21. Write a PHP program to find the single element in an array where every element appears three times except for one
22. Write a PHP program to find majority element in an array.
23. Write a PHP program to find the length of the last word in a string
24. Write a PHP program to find the single number which occurs odd number of times and other numbers occur even number of times.
25. Create a PHP program to demonstrate the different file handling methods.
26. Create a PHP program to demonstrate the different predefined function in array, Math, Data & Regular Expression.
27. Implement a basic registration and login system using forms, sending requests, and working with a MySQL database
    The common features would be:
    a. Present the user with a login page (say, "login.php");
    b. If login is successful go to the next page (say, "welcome.php")
    c. If login fails, redirect user to login page again (better yet, with error message)
    d. If the next page ("welcome.php") is accessed directly without ever logging in, the access MUST be denied (again, with error message)
28. Write a program in PHP to create access and destroy session.
29. Write a program to add constructor to bank account class that initialize account number and an initial amount of money.
30. Mini Project by each student:
    Few of the projects are as follows:
    a. Student Tracking System
    b. Mobile Wallet
    c. Toll Collection
    d. Asset Tracking System
    e. Feedback system

Suggested Readings:

1. Ivan Bayross, 2010, HTML, DHTML, PERL, CGI, BPB Publications.
2. Mike McGrath, 2012, PHP and MySQL, Tata McGraw Hill
3. Lynn Beighley, 2008, Head First PHP & MySQL, O'Reilly Media
4. W.Jason Gilmore, 2010, Beginning PHP and MySQL from Novice to Professional, Apress.
5. Luke Welling Laura Thomson, 2016, PHP and MySql web Development, Addison-Wesley Professional

Note: Only latest editions of the books are recommended

Software required/ Web links:

Web Server: Apache HTTP Server 2.2
Database Server: MySql Server 5.0
https://www.phptpoint.com/software-requirement/
https://www.javatpoint.com/php-tutorial

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-355.1	3	2	1			2							1	1
MCA-DS-355.2		1		1			1	1	1	2			3	2
MCA-DS-355.3		3							1				3	3
MCA-DS-355.4		3						1					3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-356: MULTIMEDIA AND ANIMATION LAB

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

Course Type: Domain Specific

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

MCA-DS-356.1. : Understand the fundamentals of different elements of multimedia.
MCA-DS-356.2. : Work on Photoshop software
MCA-DS-356.3. : Gain expertise in Flash 2D designing
MCA-DS-356.4. : Learn to navigate and use some modeling tools that will help to gain a strong foundation in 3D design software Blender

List of Experiments:

Adobe Photoshop

1. Introduction to Photoshop Basics
2. Design a poster for 2019 elections and show the difference in quality and resolution for Print and Web.
3. Pick any picture of a magazine cover page and make changes using Selection tool
4. Draw a landscape using multiple Layers
5. Paint a scenary of a park using different tools of Photoshop
6. Take image from different Image Sources show variation in resolution
7. Using effective Cropping, design a collage
8. Using Adobe® Bridge® show Automations
9. Design a scenary showing correction of image tonality
10. Make a poster by adjusting Image Colors
11. Painting the cover page of your magazine with Special Photoshop Tools
12. Design a card on the occasion of Diwali using atleast 3 different filters.
13. Make your passport size picture with all editing and print multiple copies of the same on A4 size page.

Macromedia Flash

14 . Introduction to the layout and tools of Flash
15 . Move a car from left to right of the screen using symbols
16 . Design a movie clip
17 . Using timeline, design the casting of the movie directed by you
18 . Depict a small story using 2 D animation

Blender

19 . Introduction to Blender and its various tools
20 . Create an object using blender and show its motion
21 . Using Selections and Transform make a scenary
22 . Design a character for your game using modelling
23 . Depict the change in Materials, Lights and Rendering in 3 different frames
24 . Using Blender show compositing

Suggested Readings:

1. Sinclair, 2008, Multimedia on the PC, BPB
2. David Vogeleer, 2005, Macromedia Flash Professional 8 Unleashed
3. Tay Vaughan, 2011, Multimedia making it works, TMH

Note: Only latest editions of the books are recommended.

Software required:

Adobe photoshop CS6
Macromedia Flash
Blender software

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-356.1.		1			2		1	1	2		1		3	3
MCA-DS-356.2.		1			2		1	1	2		1		2	1
MCA-DS-356.3.		1			2		1	1	2		2	3	3	2
MCA-DS-356.4.		1			2		1	1	2		2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-352: DATA STRUCTURES LAB

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

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

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

MCA-DS-352.1 Analyze the asymptotic performance of various algorithms
MCA-DS-352.2 Design and implement various algorithms with use of arrays, records, linked structures, stacks, queues, trees, and graphs
MCA-DS-352.3 Demonstrate different methods for traversing trees.
MCA-DS-352.4 Compare alternative implementations of data structures with respect to performance.
MCA-DS-352.5 Design and develop non-linear data structure like Trees and Graphs.

List of Experiments:

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

26. Write a program in C to perform deletion operation in Binary Tree.
27. Write a program in C to perform tree traversal methods.
28. Write a program in C to perform insertion and deletion in Binary Search Tree.

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

Software required/Web links:

Turbo C++
https://www.tutorialspoint.com/data_structures_algorithms
https://www.includehelp.com/data-structure-tutorial

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-352.1	1	1	1		2		2						2	3
MCA-DS-352.2	1	1	1				2						3	3
MCA-DS-352.3	1	1	2	2	1		1	2					1	2
MCA-DS-352.4	1	1	2	2	1		2	2				3	2	2
MCA-DS-352.5	1	1	1	1	2		2	3				3	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-353: OBJECT ORIENTED PROGRAMMING IN JAVA LAB

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

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

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

MCA-DS-353.1. Solve basic problems using concepts of object-oriented programming.
MCA-DS-353.2. Implement solutions to complex problems using Control Structures, string manipulation and functions.
MCA-DS-353.3. Propose the use of techniques (inheritance, polymorphism) by implementing them in the Java programming language to solve the given problem
MCA-DS-353.4. Develop a full-fledged responsive GUI Application using Java AWT and event handling framework.

List of Practical :

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

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

14. Write a Java Program to find product of two matrices.
15. Write a Java Program to find sum and subtraction of two matrices.
16. Write a Java Program to sort the list in ascending Order.

17. Write a Java Program to convert decimal into binary number.
18. Write a Java Program to find largest and smallest of n numbers.
19. Write a java program which shows the application of constructors.
20. Write a java program to find the electricity bill using inheritance. The details are as follow:

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

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

Marks	**Grade**
>90	Excellent
>60 and <=90	Good
Below 60	Average

The format of output is as follow:
Marks of subject 1
Marks of Subject 2
Marks of subject 3
Marks obtained
Total Marks
%Age

22. Write a java program which shows importing of classes from other packages.
23. Write a java program which creates threads using the thread class.
24. Write a java program which use try and catch for exception handling.
25. Write a java program which use multiple catch blocks.
26. Write a java program which shows throwing our own exception.
27. Write a program to handle Labels and Buttons using AWT Controls.
28. Write a program to handle Check Boxes using AWT Controls
29. Write a program to handle Lists and Scroll Bars using AWT Controls
30. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

a) Java Application World: A Java Application World software where user can use applications developed in Java such as calculator, notepad+, puzzle game, ip finder, word count tool, source code generator, picture puzzle game, tic tac toe game and exam system.

b) Connect Globe: It provides a common platform to share the common people experiences, information's and harassments all over the world and people can discuss on any topic created by only registered user. Moreover, he/she can give the advice on any topic or report.

Suggested Readings:

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

Software required/Weblinks :

JDK 1.8
https://www.tutorialspoint.com/java/index.htm

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

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-353.1	3				1	1	2						1	2
MCA-DS-353.2		2	2		2	2	2				2		3	3
MCA-DS-353.3	2	2		1		1	1	1	1		2		2	3
MCA-DS-353.4	2	2				1	1	1	1		1	1	3	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-DS-357: PYTHON PROGRAMMING LAB

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

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

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

MCA-DS-357.1. Develop programs using basics of Python.
MCA-DS-357.2. Implement object oriented concepts related to Python.
MCA-DS-357.3. Use Python data structures to solve complex problems.
MCA-DS-357.4. Solve real life problems using various python libraries and functions.
MCA-DS-357.5. Develop applications using python programming language.

List of Practical:

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

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

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

9. Write a Python program which accepts a sequence of comma-separated numbers from user and generate a list and a tuple with those numbers.
10. Write a Python program to calculate the sum of three given numbers, if the values are equal then return thrice of their sum.
11. Write a Python program to test whether a passed letter is a vowel or not

12. Take a list, say for example this one:
    a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89]
    and write a program that prints out all the elements of the list that are less than 5.

Extras:

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

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

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

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

Suggested Readings:

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

Note: Only latest editions of the books are recommended

Software required/ Web links:

Python 3.6.4
https://www.tutorialspoint.com/python/index.htm
https://www.programiz.com/python-programming/first-program

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-357.1	3						3						1	2
MCA-DS-357.2	2	3					3						2	3
MCA-DS-357.3			2				3						1	3
MCA-DS-357.4		2	2		2		3						2	1
MCA-DS-357.5	2	2	2		2		3						3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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

MCA-DS-001 :Fundamentals of Computer Programming

Periods/week Credits	Max. Marks : 200
L: 2 T: 0P :0 Audit Pass	Continuous Evaluation : 100
Duration of Examination: 3 Hrs	End Term Examination : 100

Pre-Requisite: None
Course Type: Fundamental
Course Coordinator/ Co-Coordinator: Mr. Siddharth Verma

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

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

PART - A

UNIT 1: Introduction to Programming

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

UNIT 2:Programming Standards

2. 1 Flow Chart
2.2 Pseudo Code and Hierarchy Chart
2.3 Syntax Errors
2.4 Logical Errors and Runtime Errors
2.5 Detailed Working of a Compiler
2.6 Difference Between Compiler and Interpreter.

UNIT 3:Programming Controls

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

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Turbo C
Python 3.x
https://www.tutorialspoint.com/cprogramming/index.htm
https://www.cprogramming.com/tutorial/c-tutorial.html

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-001.1	1				2	1	3	2	1	-			2	1
MCA-DS-001.2		3	2	1			3			3		1		3
MCA-DS-001.3	1	3	2	2	2				1				2	1
MCA-DS-001.4	2	1		1	2							1	2	2
MCA-DS-001.5	1	1	2		2	1				2			2	2

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

MCA-DS-002: ELEMENTS OF MATHEMATICS

Periods/week	Credits	Max. Marks : 200
L: 2	Audit Pass	Continuous Evaluation : 100
Duration of Examination: 3 Hrs		End Semester Examination : 100

Pre-Requisite: None
Course Type: Fundamental
Course Coordinator/ Co-Coordinator: Dr. Sonal Pathak/Seema Sharma

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

MCA-DS-002.1. Understand the concept of matrices and various operations performed on matrices
MCA-DS-002.2. Learn basic concepts of probability
MCA-DS-002.3. Use different types of functions
MCA-DS-002.4. Develop the concept of Set, Relations and Function
MCA-DS-002.5. Apply mathematics in real life.

PART-A

UNIT 1: Set Theory
1.1 Elements of set methods of describing a set
1.2 Types of Set
1.3 Venn diagram
1.4 Difference of a set
1.5 Union intersection and difference of set duality and applications
1.6 Partitioning of a set

UNIT 2:Relation and Function
2.1 Definition of Relation
2.2 Application of relation
2.3 Definition of function
2.4 Cartesian product
2.5 Concepts of domain, co-domain and range
2.6 Application on domain and range

UNIT 3: Matrices and Determinants
3.1 Matrices
3.2 Types of matrices
3.3 Operation on matrices
3.4 Scalar multiplication and multiplication of matrices
3.5 Determinant
3.6 Inverse of matrices
3.7 Cramer's Rule

PART- B

UNIT 4: Binomial and Permutations, Combinations
4.1 Definition and basics of 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
5.1Quadrant Planes
5.2Distance Formula
5.3 Section Formula
5.4 Bisection Formula,
5.5 Slope
5.6 Equations of straight Line
5.7 Angle between two lines.

UNIT6: Probability
6.1 Basics of Probability
6.2 Addition Theorem on Probability
6.3 Conditional Probability
6.4 Multiplication Theorem on Probability
6.5 Independent Events
6.6 Baye's Theorem

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

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

Distribution of Continuous Evaluation Table:

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

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-002.1	1		1	2	2		3						3	1
MCA-DS-002.2	1	1	2	3	1		2						3	1
MCA-DS-002.3	1	2	2	1	2								2	1
MCA-DS-002.4	1	1	2	1	1		3						1	2
MCA-DS-002.5	1	1	2	1			2	3					2	2

SEMESTER II

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-RIC-II: Research and Innovation Catalyst-II

Periods/week	Credits	Max. Marks : 50
T: 1	0.5	Continuous Evaluation : 50

Pre-requisites: Research and Innovation Catalyst-I

Course Type: Research & Training

Course Outcomes:

MCA-RIC-II.1. The students will be able to critically evaluate the work done by various researchers relevant to The research topic

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

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

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

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

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

Unit 1: Literature Survey (LS)

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

Unit 2: Structuring of Review Paper

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

Unit 3: Presenting the findings

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

References:

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

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	· Percentage of classes attended by the students	3+2	5
Group participation and response of the students to a given task	· Judge individual student in the group · Meeting timelines as per lesson plan	5 10	15
Literature Survey	· 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	· 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)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
MCA-RIC-II.1	√	√		√									√	√	√	√
MCA-RIC-II.2	√			√		√				√			√	√	√	√
MCA-RIC-II.3	√			√		√				√			√	√	√	√
MCA-RIC-II.4		√		√		√		√		√			√	√	√	√
MCA-RIC-II.5																
MCA-RIC-II.6																

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-402: DATA COMMUNICATIONS

Periods/week Credits — Max. Marks : 200
L: 3 3 — Continuous Evaluation: 100
Duration of Examination: 3 Hrs — End Semester Examination: 100

Pre-Requisite: Knowledge of Computer Networks
Course Type: Core

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

MCA-DS-402.1. Describe the basic concepts of data communication.
MCA-DS-402.2. Understand various network components and standards used in data communication.
MCA-DS-402.3. Demonstrate the framework of computer networks.
MCA-DS-402.4. Illustrate the layered architecture and data flow.
MCA-DS-402.5. Summarize the processes and protocols applied in data communication.

PART-A

UNIT 1: Basic Concepts of Data Communication
1.1 Introduction to data communication
1.2 Components of data communication
1.3 Advantages and applications of Networking
1.4 Network Topologies
1.5 Network Protocols
1.6 Connection –oriented and Connection-less Services
1.7 Modes of data transmission

UNIT 2: Signals and Transmission Media
2.1 Signal and data
2.2 Channel Characteristics
2.3 Encoding and Modulation Techniques
2.4 Transmission Media: Guided Media (Twisted Pair, Co-axial cable, Optical Fiber), Unguided Media (Radio, Microwave, Satellite)
2.5 Transmission Impairments
2.6 Multiplexing (Frequency Division Multiplexing, Time Division Multiplexing, Wavelength Division Multiplexing)
2.7 Switching (Circuit Switching, Packet Switching, Message Switching)

UNIT 3: System Architecture and Layered Protocol Models
3.1 Protocol hierarchies
3.2 Layered Architecture
3.3 ISO OSI Reference Model
3.4 TCP/IP Model

PART-B

UNIT 4: Data link Layer
4.1 Functions of Data Link Layer
4.1 Framing of data
4.2 Flow Control

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

UNIT 5: Transport Layer
5.1 Functions of Transport Layer
5.2 TCP and UDP
5.3 Routing Algorithms (Static Routing Algorithms: Shortest Path Routing, Dynamic Routing: Distance Vector Routing, Link State Routing)
5.4 Congestion control (Congestion Avoidance, Discarding and Leaky Bucket Algorithm)
5.5 Fault handling
5.6 Access control

UNIT 6: IEEE Standards, Protocols & Addressing
6.1 Logical link Control (LLC)
6.2 IEEE Standard 802.3(Ethernet)
6.3 IEEE Standard 802.4 (Token Bus)
6.4 IEEE Standard 802.5 (Token Ring)
6.5 X.25
6.6 Frame Relay
6.7 Asynchronous Transfer Mode (ATM)
6.8 IPv4 & IPv6

Suggested Readings:
1. B. Forouzan, 2017, Data Communication and Networking, Tata McGraw Hill.
2. A.S. Tanenbaum, 2002, Computer networks, Prentice Hall.
3. Black, Computer networks, 1993, Protocol Standards and Interfaces, Prentice Hall Education

Note: Only latest editions of the books are recommended.

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

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

Distribution of Continuous Evaluation Table:

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

Class performance	10%
Attendance	10%

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-402.1		2		1		1	3						2	1
MCA-DS-402.2	2	2	2				3			1			3	2
MCA-DS-402.3		3		1			2						2	
MCA-DS-402.4	2	3			1		2		1		1		1	2
MCA-DS-402.5	2	1	1		2		3			1				

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-403: ANALYSIS AND DESIGN OF ALGORITHM

Periods/week Credits	Marks : 200
L: 3 T: 0 3	Continuous Evaluation : 100
Duration of Examination: 3 Hrs	End Semester Examination : 100

Pre-Requisite: Knowledge of C Programming and Data Structures
Course Type: Core

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

MCA-DS-403.1. Learn the basics of various computer algorithms.
MCA-DS-403.2. Understand the algorithm in terms of time and space complexity.
MCA-DS-403.3. Apply Divide & Conquer approach and Greedy method to solve critical problems.
MCA-DS-403.4. Analyze algorithms for finding optimal solution
MCA-DS-403.5. Evaluate programming problems using Backtracking method.
MCA-DS-403.6. Design the deterministic and non-deterministic polynomial time algorithms.

PART -A

UNIT 1: Introduction to Algorithm
1.1 Algorithm analysis
1.2 Problem solving approach
1.3 Asymptotic analysis
1.4 Analysis of Non-recursive and Recursive Algorithm
1.5 Sets and disjoint sets union

UNIT 2: Divide and Conquer approach
2.1 Introduction to Divide and Conquer approach
2.2 Binary search
2.3 Merge sort
2.4 Quick sort
2.5 Selection sort
2.6 Stassen's matrix multiplication algorithms

UNIT 3: Greedy Method
3.1 Introduction to Greedy Method
3.2 Knapsack problem
3.3 Job sequencing with dead lines
3.4 Minimum Spanning Trees: Kruskal and Prim's method
3.5 Single source shortest paths (Dijesktra's algorithm).

PART-B

UNIT 4: Dynamic Programming
4.1 General method
4.2 Optimal binary search trees
4.3 0/1 knapsack
4.4 Traveling salesperson problem

UNIT 5: Backtracking

5.1 General Method
5.2 8 queen's problem
5.3 Graph colouring
5.4 Hamiltonian cycles
5.5 Introduction to Branch and Bound approach
5.6 0/1 knapsack
5.7 Traveling salesperson problem.

UNIT 6: Problem Classes

6.1 Polynomial and Non Polynomial classes
6.2 NP-hard and NP-complete
6.3 Deterministic and non-deterministic polynomial time algorithms,
6.4 Cook's theorem
6.5 NP scheduling problems.

Suggested Readings:

1. Ellis Horowitz and Sartaj Sahni, 2008, Fundamentals of Computer Algorithms, Galgotia Publications.
2. Aho A.V.Hopcroft J.E, 1974, The Design and Analysis of Computer Algorithm, Addison Wesley.
3. Thomas H. Coreman, 2009, Introduction to Algorithm, McGraw-Hill

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Dev C/ Turbo C++
https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
https://www.youtube.com/watch?v=1PI58Q3Ne2w

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

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
MCA-DS-403.1	3	3	3	3	1		3				2	3	3	3
MCA-DS-403.2	3	3	3	2	2		2				2	3	3	3
MCA-DS-403.3	3	3	3	3	3		3				2	3	3	3
MCA-DS-403.4	3	3	3	2	1		2				2	3	3	3
MCA-DS-403.5	3	3	3	3	3		3	2			2	3	3	3
MCA-DS-403.6	1	2	1	2	1		2				2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-404: ARTIFICIAL INTELLIGENCE

Periods/week Credits	Max. Marks : 200
L: 3 T: 0 3	Continuous Evaluation : 100
Duration of Examination: 3 Hrs	End Semester Examination : 100

Pre-Requisite: Basics of Data Structure
Course Type: Core

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

MCA-DS-404.1. Understand the fundamental concepts of Artificial Intelligence
MCA-DS-404.2. Interpret the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
MCA-DS-404.3. Apply knowledge representation, reasoning, and machine learning techniques to real-world problems
MCA-DS-404.4. Examine various AI search algorithms
MCA-DS-404.5. Assess critically the Artificial Intelligence techniques presented and apply them to real world problems

PART-A

Unit 1: Introduction to Artificial Intelligence
1.1 Foundations, scope, problems, characteristics, examples and approaches of AI
1.2 Application Areas of Artificial Intelligence
1.3 Problem solving in Artificial Intelligence: Tic-Tac-Toe, Water Jug problem
1.4 Current trends in Intelligent Systems
1.5 AI application to robotics
1.6 Goal driven Learning agents
1.7 Programming Languages of Artificial Intelligence

Unit 2: Problem Solving Concepts and AI Search Techniques
2.1 Problem Solving Concepts and Methods
2.2 Types of Search techniques: Uninformed (Blind) and Informed (Informed) techniques
2.2 Blind search techniques: Breadth-First search and Depth- First search methods
2.3 Heuristic search techniques
2.5 Best First search, Means-ends Analysis Technique
2.6 Problem reduction, Constraint satisfaction

Unit 3: Knowledge Representation
3.1 Foundations of knowledge representation and reasoning
3.2 Prepositional and Predicate logic
3.3 Syntax and Semantics for first order logic
3.4 Resolution and Unification
3.5 Knowledge representation schemes: semantic nets, frames

PART-B

Unit 4: Reasoning and Game Playing
4.1 Reasoning about Knowledge, Default Reasoning

4.2 Reasoning with uncertain knowledge
4.3 Probability Based Reasoning
4.4 Reasoning Using Certainty Factors; Bayes Theorem
4.5 Fuzzy Based Reasoning Systems
4.6 Games playing: Minimax algorithm, Tic-Tac-Toe

Unit 5: Expert Systems & Natural Language Processing
5.1 Expert system: Definition and applications
5.2 Characteristics of expert system
5.3 Basic components & architecture of expert systems
5.4 Introduction to Natural Language Processing (NLP)
5.5 Parsing techniques

Unit 6: Machine Learning and Neural Networks
6.1 Introduction to Machine Learning
6.2 Learning techniques
6.3 Applications of Machine Learning
6.4 Introduction to Neural Network
6.5 Artificial and Biological Neurons
6.6 Classifications of Neural Network

Suggested Readings:
1. Stuart Russell and Peter Norvig, 1995, Artificial Intelligence: A Modern Approach, Pearson Education Press
2. Kevin Knight, Elaine Rich, B. Nair, 2017, Artificial Intelligence, McGraw Hill.
3. George F. Luger, 2002, Artificial Intelligence, Pearson Education

Note: Only latest editions of the books are recommended.

Web links:
http://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf
https://epub.uni-regensburg.de/13629/1/ubr06078_ocr.pdf
http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
https://www.docsity.com/en/study-notes/computer-science/artificial-intelligence/
https://examupdates.in/artificial-intelligence-pdf/

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-404.1	2	2	2	2		2							1	1
MCA-DS-404.2	1	3	1	3		2								1
MCA-DS-404.3	3	2		2		1							2	2
MCA-DS-404.4	1		2			3							2	
MCA-DS-404.5	3	3		2		3							3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-451: ANDROID APPLICATION DEVELOPMENT LAB

Periods/week Credits	Max. Marks : 100
L: 0 T: 0 P: 4 2	Continuous Evaluation: 50
Duration of Examination: 3Hrs	End Semester Examination: 50

Co-requisite: Knowledge of Java Programming.
Course Type: Core

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

MCA-DS-451.1. Describe the application lifecycle, intents, and activities.
MCA-DS-451.2. Identify and understand the usage of UI-Components, layouts, event handling.
MCA-DS-451.3.Demonstrate the usage of broadcast receivers, services, Android's APIs for data storage, retrieval, user preferences, files, and databases.
MCA-DS-451.4.Differentiate between major UI Components and understand the selection of components based on the requirement.
MCA-DS-451.5.Develop and deploy an Android application.
MCA-DS-451.6.Develop basic applications that act as a working example of all the topics covered in the Course.

Concepts & List of Experiments:-

Activity 1: Introduction to Android Platform.

Concept: Overview of android platform architecture.

Practical:

a) Build & Simulate the first "HelloWorld" Application.

Activity 2: User Interface (UI) Development in Android.

Concept: Overview of different Layouts:

- Linear Layouts
- Grid Layouts

Concept: Introduction about Text Controls:

- TextView
- EditText

Practical:

a) Add TextView to the LinearLayout.

b) Add TextView to the GridLayout.

Activity 3: Introduction to the range of UI Components.

Concept: Other UI components are:

- Buttons Controls
- Input Controls

Practical:

a) Design layout to show working of button and input controls.

Activity 4: Make Interactive UI using Event Handling.

Concept: Identify resources with IDs and programmatically change the Ids, onClick Attribute.

Practical:

a) Add click behavior to a button (show a toast).

b) Change text of text View on button click.

Activity 5: Introduction to various Views.

Concept:

- How to make activities scrollable?
- How to create a ListView in Android?

Practical:

a) Use a scroll view for text with minor changes in HTML formatting.

b) Create a listViewand also implement its onClick attribute.

Activity 6: Activities and Intents

Concept: Creating apps with multiple activities. Starting activities with both explicit and implicit intents. Sending data between activities. Understanding activity lifecycle.

Practical:
a) Create a new activity and layout
b) Start the new activity from an existing activity with an explicit intent
c) Pass user-entered information from one activity to the other
d) Pass information back to the main activity.

Activity 7: Overview of Menus

Concept:

- Options menu.
- Adding menu items.
- Handling onClick from menus.

Practical:

a) Set up an options menu.

b) Add items to the option menu.

c) Add up navigation to the app bar.

d) Implement onClick for menus.

Activity 8: Implement Broadcast Receiver.

Concept: What is a Broadcast Receiver?

Practical:

a) Create an app with a Broadcast Receiver.

Activity 9: Introduce Notifications

Concept: What is a Notification?

Practical:
a) Trigger a Notification.
b) Add Actions to your Notification.

Activity 10: Database Connectivity Using SOLlite.

Concept:

- Overview of SQLite
- Querying (dev) Searching (user) databases
- Best practices for using databases in Android

Practical:
a) Create an app that stores data in an SQL database.

Activity 11: Publishing your App

Concept: Understanding the ways of monetizing your App.

Practical:
a) Publish your App to Google Play.

Recommended Small Projects:

a) Create an accident alert app.
b) Create a diet planner app
c) Create an application for budget management of your family.
d) Create an application to stimulate calculator
e) Create an application to simulate Notepad
f) Create an application for Women Protection System

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

Suggested Readings:

1. Reto Meier, 2010, Professional Android 2 Application Development
2. Marko Gargenta, 2014, Learning Android
3. Lauren Darcey, 2010, Sams Teach Yourself Android Application Development in 24 Hours

Software required/ Web links:
Android Studio 3.x
Android SDK

https://developer.android.com/guide/
https://www.javatpoint.com/android-tutorial
https://hackr.io/tutorials/learn-android-development

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-451.1	2	3	2		3								2	3
MCA-DS-451.2.	2	3			3									
MCA-DS-451.3.	1	3	2		3									
MCA-DS-451.4.		3		2	3									
MCA-DS-451.5.		3	1		3		1							
MCA-DS-451.6.	2	3	2	2	3		1				1	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-452: R PROGRAMMING LAB

Periods/week	Credits	Max. Marks : 100
L: 0 T: 0 P: 4	2	Continuous Evaluation: 50
Duration of Examination: 3 Hrs		End Semester Examination : 50

Co-Requisite: Programming in C language
Course Type: Core

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

MCA-DS-452.1. Understand to setup R environment and R Console..
MCA-DS-452.2. Demonstrate different data structures (vectors, lists, matrices, data frames) in R.
MCA-DS-452.3. Analyze the various data sets in R programming (importing and exporting of data).
MCA-DS-452.4. Assess the data manipulation technique using R programming
MCA-DS-452.5. Develop an application inR using built-in database..

List of Experiments:-

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

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

Activity 2:Introduction to Arrays & Vectors

3) Implement recursive functions using R tool.
4) Create and modify matrix using c function (c()) in R tool.
5) Create a list using List() and perform List Slicing operation in R tool.
6) Create three vectors x,y,z with integers and each vector has 3 elements. Combine the three vectors to become a 3×3 matrix A where each column represents a vector. Change the row names to a,b,c.
7) Create a vector with 12 integers. Convert the vector to a 4*3 matrix B using matrix(). Please change the column names to x, y, z and row names to a, b, c, d.
8) Create the vector of for (1.2.3,…19.20,19,18,…2,1)
9) Create a vextor of values of
   $e^x \cos(x)$ at x= 3,3.1,3.2……..,6 ;
10) Create a character vector with length of number-of-rows-of-iris-dataset, such that, each element gets a character value – "greater than 5" if the corresponding 'Sepal.Length' > 5, else it should get "lesser than 5".Impletement it using For Loop.

Activity 3:List and Data Frames in R

11) Create a data frame in R and perform various operations.
12) Implement Linear Model Formula using 100 variables in R.
13) Write a program to expand data frame in R.
14) With the dataframes created from code below, perform the various merge operations.

```
set.seed(100)
    Df1 <- iris[sample(1:nrow(iris), 10), c(1,2,3,5)]
    Df2 <- iris[sample(1:nrow(iris), 10), c(1,2,4,5) ]
    # induce NAs
```

```
Df1 <- Df1[sample(1:nrow(Df1), 3), 4]
Df2 <- Df2[sample(1:nrow(Df1), 3), 4]
```

Activity 4: Data Analysis in R(Importing and exporting of data)

15) Generate Exploratory Analysis of Big Mart Data Set.
16) Generate Exploratory Analysis of Train Data Set.
17)Show graphical representation of Big Mart Data set using Univariate Analysis and Bivariate Analysis.
18) Show graphical representation of Train Data Set using Univariate Analysis and Bivariate Analysis.

.

Activity 5: Data Manipulation in R.

19) Calculate the count of Outlet Indentifiers,Item Identifiers and Outlet years of Big mart Data Set.
20) Calculate the count of Outlet Identifiers, Item Identifiers and Outlet years of Big mart Data Set.

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

Suggested Readings:

1. Garrett Grolemund, 2014, Hands on Programming with R
2. Mark Gardener, 2013, Beginning R: The Statistical Programming Language
Note: Only latest editions of the books are recommended.

Software required:

R Studio

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
MCA-DS-452.1	1	1	1	1	2								3	3
MCA-DS-452.2	2	2	1	1	2								3	3
MCA-DS-452.3	3	3	2	2	2								3	3
MCA-DS-452.4	3	2	2	3	2								3	3
MCA-DS-452.5	1	2	3	3	2						2		3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-453: VOCATIONAL TRAINING

Periods/week Credits	Max. Marks : 100
4 Weeks 2	Continuous Evaluation : 100
Duration of Examination: 2 Hrs	End Semester Examination: ---

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

1. Describe the Systems Development Life Cycle (SDLC).
2. Construct and evaluate data flow diagrams.
3. Design and evaluate system outputs
4. Construct and evaluate entity-relationship (ER) diagrams for real projects
5. Determine the various test cases and analyze the results.
6. Develop soft-skills including writing formal reports and delivering oral presentations.

Internship experience provides the student with an opportunity to enhance the knowledge in their respective subject areas. This training provides insight to understand the actual behaviour of the industry able to develop a greater understanding about the career option. Each of the students is required to develop a mini project during his/ her one month internship. Evaluation will be done by the respective mentors. Internal assessment will be done on the basis of following criteria:

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

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-405: CYBER SECURITY

Periods/week	Credits	Max. Marks : 200
L: 2 T: 0	2	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of computer hardware, software and computer networks
Course Type: Domain Elective

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

MCA-DS-405.1. Understand of basic concept and issues related to Cyber Security.
MCA-DS-405.2. Distinguish various tools used in Cyber Security.
MCA-DS-405.3. Identify various mechanisms to protect themselves from various security threats on the internet.
MCA-DS-405.4. Use security tools to enhance system security.
MCA-DS-405.5. 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

4.1 Ciphers and Secret Message
4.2 Security Attacks and Services

4.3 Mathematical Tools for Cryptography
4.4 Theory of Block Cipher Design
4.5 Cipher Network Structures

UNIT 5: Digital Signatures, Certificates, and Standards
5.1 Digital Signature Standard and Authentication (DSS and DSA)
5.2 Public key Infrastructure
5.3 Digital Certificates
5.4 Basics of Public Key Cryptography Standards (PKCS)
5.5 Internet Protocol and Web Security Protocols

UNIT 6: Introduction to Cyber Crime Investigation
6.1 Password Cracking
6.2 Keyloggers and Spyware
6.3 Trojan and backdoors
6.4 SQL Injection
6.5 Buffer Overflow
6.6 Attack on wireless Networks
6.7 Website Attacks

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

Software required/ Web links:
https://www.tutorialspoint.com/ cyber security/index.htm

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-405.1	2		1	1			2						3	3
MCA-DS-405.2	1	3	1		1		1						2	2
MCA-DS-405.3			2	2		2	1							
MCA-DS-405.4	1	2					1							
MCA-DS-405.5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-406: MOBILE COMPUTING

Periods/week	Credits	Max. Marks : 200
L: 2 T: 0	2	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of Computer Networks
Course Type: Domain Elective

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

MCA-DS-406.1 Define the concept of wireless communication & design of various cellular systems.
MCA-DS-406.2 Describe working principle of wireless LAN and its standards.
MCA-DS-406.3 Explain various techniques of multiple user access to scarce radio spectrum resources.
MCA-DS-406.4 Compare different protocols for mobile adhoc networks
MCA-DS-406.5 Analyze the working of the GPS system and the concept of location based routing.
MCA-DS-406.6 `Design applications based on emerging technologies like Bluetooth, RFID, WI-MAX and Mobile IP.

PART -A

Unit 1: Introduction to Mobile Computing
1.1 Mobile computing features & characteristics
1.2 Issues in mobile computing
1.3 Novel applications
1.4 Limitations and architecture
1.5 Cellular concept
1.6 Air-interface
1.7 Channel structure
1.8 Channel allocation in cellular systems
1.9 GSM Architecture, GSM entities, call routing in GSM, CDMA
1.10 GPRS network architecture, network operations, data services, limitations, applications

Unit 2: Wireless LAN
2.1 IEEE 802.11 standards
2.2 Wireless LAN advantages and applications
2.3 Wireless LAN Architecture
2.4 Mobility in Wireless LAN
2.5 Security in Wireless LAN
2.6 WIFI versus 3G

Unit-3: Wireless Application Protocol (WAP)
3.1 Wireless Application Architecture
3.2 Wireless Application protocol Stack
3.3 Wireless Application environment
3.4 Wireless Application push architecture
3.5 Wireless Application push framework
3.6 Wireless session protocol
3.7 Wireless transmission protocol

3.8 WAP gateways and Applications

PART -B

Unit 4: Mobile Adhoc Network

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

Unit 5: Routing Protocols in Reference to Mobile Computing

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

Unit 6: **Emerging Technologies & Mobile IP**

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

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

Web links:

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

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-406.1	2		1	1			2						3	3
MCA-DS-406.2	1	3	1		1		1						2	2
MCA-DS-406.3	1	2	2	2		2	1						2	3
MCA-DS-406.4	1	2	2	2	3	2	1						3	2
MCA-DS-406.5	2	3	2	2		2	2	1					2	2
MCA-DS-406.6	3	2	2	1		1	2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-407: **SYSTEM PROGRAMMING**

Periods/week Credits
L: 2 T: 0 2

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

Duration of Examination: 3 Hrs

Pre-Requisite: Knowledge of Computer Hardware
Course Type: Domain Elective

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

MCA-DS-407.1. Understand the programming environment, software tools and different translators used in programming environment
MCA-DS-407.2. Define the basics of system programs like editors, compiler, assembler, linker, loader interpreter, macros and debugger.
MCA-DS-407.3. Apply the knowledge and techniques learnt to develop solutions to real world problems;
MCA-DS-407.4. Design and implement system level programs.
MCA-DS-407.5. Write system software with the aid of sophisticated OS services, programming languages and utility tools.

PART –A

Unit 1: Introduction to System Programming
1.1 Concepts of Compilers
1.2 Concepts of Assembler
1.3 Concepts of Loader
1.4 Concepts of Linker
1.5 Concepts of Interpreter
1.6 Concepts of Macro Preprocessor
1.7 Concepts of Operating System Structure
1.8 Concepts of Interrupt Handling and Device Drivers

Unit 2: Directories and File Systems
2.1 File and Manuals
2.2 File Organization
2.3 Access Method
2.4 Directories & its organization
2.5 File Properties and File Systems
2.6 Process and Programs
2.7 Allocation Schemes
2.8 I/O redirection and pipes

Unit 3: Compilers: An overview
3.1 Functions and features of Compilers
3.2 Phases of compilation
3.3 Applications of Linked List
3.4 Comparison of compilers and interpreters
3.5 Code optimization

3.6 Compilation of Expression
3.7 Compilation of Control Structure
3.8 Code generation algorithm and DAG representation

PART-B

Unit 4: Macro Preprocessor and Its Function

4.1 Introduction to macro function
4.2 Macro Definition and Call
4.3 Features of macros
4.4 Nested Macro Calls
4.5 Design of a Macro Assembler
4.6 Functions of a Macro Processor
4.7 Basic Tasks of a Macro Processor
4.8 Design of two pass Macro Pre- processor
4.9 Macro expansion
4.10 Nested macro calls

Unit 5: Loaders and Linkers

5.1 Features and functions of loaders
5.2 Overview of loading Schemes
5.3 Go & compile loader
5.4 Relocation loading scheme
5.3 Design of Absolute loader
5.4 Design of Direct linking loader
5.5 Program linking
5.6 Static and Dynamic Linking
5.7 Relocation of linking concepts

Unit 6: Introduction to Software Tools and Assembly Language

6.1 Introduction to software tools for program development
6.2 Introduction to editors with their types
6.3 Function of debug monitor
6.4 Features and functions of assembly language
6.5 Design of one-pass and Two-pass Assemblers
6.6 Function of Load and Go Assembler.

Suggested Readings:

1. Dhamdhere, 2011, System Programming and Operating System, Tata McGraw- Hill.
2. John J. Donovan, 2010, System Programming, Tata McGraw- Hill.
3. Beck and Manjula, 2016, System software, Pearson Education
4. R.K Maurya, 2014, System Programming and Compiler Construction, Wiley-Dreamtec.

Note: Only latest editions of the books are recommended.

Web links:

https://sites.google.com/a/venusict.org/system-programming/nptel-vide
https://www.docsity.com/en/study-notes/computer-science/system-programming/
https://www.scribd.com/document/262840706/Notes-of-System-Programming

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one

from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table:

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-407.1	3	2	3	1	1		1						1	3
MCA-DS-407.2	2	1	3	2	2	2	1	2		1	2		2	3
MCA-DS-407.3	3	1	1	1	1		1		2				1	3
MCA-DS-407.4	1	3	2	1	1		1	1					2	3
MCA-DS-407.5	2	1	1	2	3		1	1	1				1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-EC-301: Azure Fundamentals

Periods/week	Credits	Max. Mark: 200
L: 2 T: 0	2	Continu ous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: NA

Course Type: Domain Specific

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

MCA-EC-301.1 Be familiar with the general cloud technology concepts
MCA-EC-301.2 Build knowledge of Azure services and Azure workloads.
MCA-EC-301.3 Detail knowledge of security and privacy in Azure, Azure pricing and support.
MCA-EC-301.4 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 Thread 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

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

Distribution of Continuous Evaluation Table

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-EC-301.1	2	3	2	2	2	1					1			1
MCA-EC-301.2	2	3			2							1		2
MCA-EC-301.3	2	2	2	3	2	2	1						1	1
MCA-EC-301.4		3		2	2									1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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NAAC 'A' Grade University

MCA-ID-001:**Employability Skills Enhancement**

MCA

Periods/week	Credits	Max. Marks	: 100
L: 2 T:0 P: 0	2	Continuous Evaluation	: 50
Duration of Exam: 2 hrs		End Semester Examination	: 50

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

MCA-ID-001.1. Recognize problems based on arithmetic & number system.
MCA-ID-001.2. Solve problems based on verbal reasoning & simplification.
MCA-ID-001.3. Enhance skills sets and capabilities to effectively manage first impressions
MCA-ID-001.4. Develop their vocabulary and grammar
MCA-ID-001.5. Use the language syntax with accuracy in written text
MCA-ID-001.6. Enhance their reading skills & build verbal reasoning skills.

Part A

Unit 1: Arithmetic I

1.1 Percentages
1.2 Ratio & Proportion
- 1.2.1. Proportionality
- 1.2.2. Variations
- 1.2.3 Partnership

1.3 Profit & Loss
- 1.3.1. Basic terminology & Formulae
- 1.3.2. Error in Weights
- 1.3.3. Marked Price and Discounts

Unit 2: Arithmetic II

2.1 Time & Work
- 2.1.1. Time and Work, Chain Rule
- 2.1.2. Work & Wages
- 2.1.3. Pipes & Cisterns

2.2 Mixtures & Alligations

Unit 3: Verbal Reasoning

3.1 Coding-Decoding
3.2 Number Ranking & Sequence
3.3 Arithmetic Reasoning

Part B

Unit 4: Advanced Vocabulary

4.1 Synonym & Antonym
4.2 One Word Substitution
4.3 Ordering of Words
4.4 Idioms and Phrases
4.5 Vocabulary, COW, Punctuation

Unit 5: Sentence Construction & Syntax

5.1 Sentence Improvement
5.2 Spotting Errors
5.3 Ordering of Sentences
5.4 Change of Voice/ Direct & Indirect speech
5.5 Completing Statements/Sentences

Unit 6: Reading Comprehension & Reasoning

6.1 Strategic Reading, Eliminating Poor Reading Habits
6.2 Techniques to increase speed reading, comprehension and recall
6.3 Solving Sample RC Passages
6.4 Closet Test
6.5 Para Jumbles

Text Books/Reference Books:

1. R S Aggarwal, 2017, Quantitative Aptitude for Competitive Examinations, S Chand & Company Pvt Ltd
2. R S Aggarwal, 2018, A Modern Approach to Verbal & Non Verbal Reasoning, S Chand & Company Pvt Ltd
3. R S Aggarwal, 2018, A Modern Approach to Verbal& Non Verbal Reasoning, S Chand & Company Pvt Ltd
4. P.A. Anand, 2016, Verbal Ability and Reasoning for Competitive Examinations, Wiley

Instructions for paper setting: Fifty MCQ will be set in total. Twenty Five MCQ will be set from Part A and Twenty Five MCQ will be set from Part B. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator will not be allowed.

SEMESTER III

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-RIC-III: Research and Innovation Catalyst-III

Periods/week	Credits		
		Max. Marks	: 100
P: 2	1	Continuous Evaluation	: 100

Pre-requisites: Research and Innovation Catalyst-II

Course Type: Research & Training

Course outcomes

MCA-RIC-III.1.The students will be able to compare the various research methodologies and thereupon choosing the appropriate one.

MCA-RIC-III.2. To apply the contextual knowledge in designing and conducting the experiments

MCA-RIC-III.3. To analyze and interpret the research/ innovation outcomes

MCA-RIC-III.4. To analyze the further scope of research/ innovation

MCA-RIC-III.5.To gain hands on experience in techniques/technologies/ case studies etc

MCA-RIC-III.6. To adapt working with group members in cohesive temperament.

Unit 1: Setting up the simulation/experiment environment

1. Deciding the hypothesis or direction to carry out simulation/experiments / case study
2. Identifying the set of experiments/simulations/ case study for designing the model or analysing the data
3. Finding the resources for performing experiments/simulations / case study
4. Choosing the appropriate research methodology/ business model

Unit 2: Planning of experiments/ case study

1. Formulate experimental procedures and case study approach
2. Procurement of materials and secondary data
3. Modification of the experimental set-up / case study approach, if required

Unit 3: Execution of experiments/simulations/ case study

1. Conduct experiments/ build prototype / case study
2. Tabulating and recording data
3. Analysis and interpretation of the data
4. Interpreting convolution between experimental data and hypothesis/simulation
5. Comparison of the results for discrepancies
6. Listing and analysing the observations to get the further research direction

References:

1. www.originlab.com
2. http://www.cambridgesoft.com/software
3. http://www.synergy.com/
4. www.mathworks.com/products/matlab.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	· Percentage of classes attended by the students	6+4	10
Group participation	· Judge individual student's participation in the experiments · Proper experimental planning · Collecting evidences substantiating to the experiments · Time bound completion of experiments	10 4 6 10	30
Execution of experiments	· Finding available resources · Usage of Scientific Literature Databases. e.g., Scopus/ Web of Science/ etc. for theoretical guidance · Understanding the technique/technology used · Analysis and interpretation of results · Percentage of reproducibility	4 4 6 4 6	24
Report and Presentation	· Presentation of slides · Experimental findings and content (Graph, Tables, Diagrams, Real time videos etc.) · Report	12 12 12	36

Course Articulation Matrix:

CO Statement (XX-500)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-RIC-III.1		√	√		√	√								
MCA-RIC-III.2		√		√							√			
MCA-RIC-III.3	√	√	√	√	√						√			
MCA-RIC-III.4														
MCA-RIC-III.5														
MCA-RIC-III.6														

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-502: ADVANCE DATABASE SYSTEMS

Periods/week Credits — Max. Marks : 200
L: 3 3 — Continuous Evaluation : 100
Duration of Examination: 3 Hrs — End Semester Examination : 100

Pre-Requisite: Knowledge of Database Management System
Course Type: Core

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

MCA-DS-502.1 Understand the concept of Advance Database Base Management System.
MCA-DS-502.2 Explore the relational databases and its different models.
MCA-DS-502.3 Apply advance SQL queries and PL/SQL programs.
MCA-DS-502.4 Analyze the different database security issues.
MCA-DS-502.5 Create and implement the ER and EER diagrams.

PART -A

UNIT 1: Relational Database Design and Implementation

1.1 Introduction to Relational Database Management System
1.2 Features of Good Relational Database Management System
1.3 Enhanced ER tools
1.4 Converting EER diagram to tables
1.5 Different Table Constraints and Characterization
1.6 Normalization : UNF, 1NF, 2NF, 3NF, EKNF, BCNF, 4NF, ETNF, 5NF, DKNF, 6NF
1.7 Inclusion Dependencies and Template Dependency

UNIT 2: Emerging Database Technologies, Applications and Environments

2.1 Database Concepts and its Architecture
- 2.1.1 Object Oriented Database
- 2.1.2 Object Relational Database
- 2.1.3 Active Database
- 2.1.4 Temporal Database
- 2.1.5 Spatial Database
- 2.1.6 Deductive Database
- 2.1.7 Mobile Database

2.2 Query Processing
2.3 Geographic Information System
2.4 Data Warehousing and Data Mining

UNIT 3: Advance SQL and PL/SQL

6.6 SQL Query Statements
6.7 Advance SQL Queries
6.8 SQL Operations : Selection, Join, Sorting, Grouping
6.9 Transformation of Relational and Logical Operations
6.10 SQL Functions
6.11 Storage and Query Optimization
6.12 Views and Query Processing
6.13 Cursors : Implicit and Explicit

6.14 Database Triggers
6.15 Exception Handling
6.16 Sub Programs : Procedures and Functions

PART-B

UNIT 4: Distributed Databases

4.1 Centralized versus non centralized Databases
4.2 Homogeneous and Heterogeneous DDBMS and their comparison
4.3 Functions and Architecture
4.4 Distributed database design, query processing in DDBMS
4.5 Distributed concurrency management, deadlock management
4.6 Concepts of replication servers

UNIT 5: Database Security and Authorization

5.1 Introduction to Database Security
5.2 Problems in Database Security and Conclusions
5.3 Levels of Database Security
5.4 Access Control
5.5 Multilevel Security
5.6 Statistical Database Security
5.7 Examples of E-Security

UNIT 6: Transaction Management and Recovery Process

6.1 Advanced feature of Transactions
6.2 Enhanced Lock Based and timestamp based Protocols
6.3 Deadlock Handling
6.4 Weak Levels of Consistency
6.6 Recovery and Atomicity
6.7 Recovery with Concurrent Transaction
6.8 Advanced Recovery Techniques
6.9 Remote Backup Systems

Suggested Readings:

1. Elmasri and Navathe, 2016, Fundamentals of Database Systems, Pearson Education
2. Raghu Ramakrishnan, 2003, Database Management Systems, Johannes Gehrke, , McGraw-Hill
3. Korth, Silberchatz, Sudarshan, 2011, Database System Concepts, McGraw-Hill.
4. Peter Rob and Coronel, 2010, Database Systems, Design, Implementation and Management, Thomson Learning.
5. C. J. Date & Longman, 2003, Introduction to Database Systems, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Oracle 9i or above versions (10g, 11i, 12c)
https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm
https://www.tutorialspoint.com/html/index.htm
https://www.w3schools.com/

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-502.1		1	2	3		2		2		3	3		3	2
MCA-DS-502.2	1	2	2	3	3	3		2	2		3		2	1
MCA-DS-502.3	1	1	2		2		2		3		2	2	2	2
MCA-DS-502.4		3	2	3			2			3			2	3
MCA-DS-502.5	1	1	2		2				2	3			2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-503: PROGRAMMING IN .NET

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Evaluation: 100
Duration of Examination: 3Hrs		End Semester Examination: 100

Prerequisite: Knowledge of Object Oriented Programming Approach

Course Type: Core

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

MCA-DS-503.1. Define the concepts of windows application programming concepts.
MCA-DS-503.2. Describe the internal working of .Net Framework.
MCA-DS-503.3. Demonstrate the usage of different tools and controls used in C# programming.
MCA-DS-503.4. Analyze the various types of database connectivity with visual studio .net.
MCA-DS-503.5. Assess various ASP.NET components and justify their usage in various programming situations.
MCA-DS-503.6. Develop a full-fledged Web Application using ASP.NET with database connectivity.

PART -A

UNIT 1: Introduction to .Net Architecture

1.1 Introduction to Visual Studio and .Net Architecture
1.2 Visual Studio IDE, Development Environment Setup
1.3 .NET Overview, CLR, Assemblies (monolithic vs. component-based applications)
1.4 Execution Model, Client-Side vs. Server-Side Programming.
1.5 Debugging using Visual Studio.
1.6 Creating Different types of Projects in Visual Studio(Web, Desktop, Library)

UNIT 2: C# Basics

2.1 Variables, Constants
2.2 Strings, Data Types
2.3 Arrays Different Types of Arrays and Operations on Arrays
2.4 Decision statements
2.5 Loop statements
2.6 Exception Handling using try – catch –finally
2.7 Name Space
2.8 Class and Objects, Creating and using Objects

Unit 3: Inheritance and Interface

3. 1 Concept of Inheritance
3. 2 Sealed class
3. 3 Operator Overloading
3. 4 Method Overloading
3. 5 Indexer Overloading
3. 6 Creating an Interface
3. 7 Implementing an Inheritance
3. 8 Inheriting an Interface

PART-B

Unit 4: Desktop Applications and Event Handling

4. 1 Windows Forms
4. 2 MsgBox, DialogBox
4. 3 Handling Mouse and Keyboard Events
4. 4 Basic Control Programming for following controls
4. 5 Button, Label , Textbox , Rich Textbox
4. 6 Radio Button , Checkbox , List Box
4. 7 Checked List Box.
4. 8 Tree View
4. 9 Picture Box, Tab Control

UNIT 5: Database Programming

5. 1 Architecture of ADO.NET
5. 2 Data Providers in ADO.NET
5. 3 Connection and Command Class
5. 4 DataReader
5. 5 DataAdapter
5. 6 DataSet and DataTable
5. 7 DataReader
5. 8 DataGridView Control
5. 9 Binding Controls with DataSets
5. 10 Reading and Writing into XML Data Files.
5. 11 Executing Stored Procedures from ADO

UNIT 6: Web Applications using ASP.NET

6. 1 Web Development and ASP NET
6. 2 Session Tracking
6. 3 ASP.NET Components: Web forms
6. 4 Basic Components (Textbox, Dropdown, Button)
6. 5 GridView and DataList Controls
6. 6 State Management
6. 7 Deploying Application in IIS Server
6. 8 Web.Config and Global.asax
6. 9 Creating Web Services
6. 10 Consuming RESTfulWeb Service in C#

Suggested Readings:

1. Daniel M. Solis, 2010, Illustrated C#, Apress Publications
2. Jack Purdum, 2007, Beginning C# 3.0 An introduction to object oriented programming, Wrox Publication
3. Jon Skeet, 2008, C# in depth, Manning Publications Co.
4. Matthew McDonald, 2010, Beginning ASP.NET 4 in C#, Apress Publications
5. Imar Spaanjaars, 2010, Beginning ASP.NET 4.5 in C# and VB,Wrox Publications

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Visual Studio 2010
Database Server: SQL Server 2008
https://docs.microsoft.com/en-us/dotnet/csharp/quick-starts/
https://www.tutorialspoint.com/csharp/

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

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-503.1	2		2	2	3	2	2		1				2	2
MCA-DS-503.2	2	2	2		3		2		1				2	2
MCA-DS-503.3	2		2	2	3	1	1			2			2	2
MCA-DS-503.4	2	2	2	2	3	2		1		2			2	2
MCA-DS-503.5	2	2	2	2	3	2	1	1		1			2	3
MCA-DS-503.6	2	2	2		3	2	1	1		1			2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-504: SOFTWARE ENGINEERING AND TESTING

Periods/week	Credits	Max. Marks	: 200
L: 3 T: 0	3	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100	

Pre-Requisite: Knowledge of fundamentals of computers

Course Type: Core

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

MCA-DS-504.1. Analyze a software development problem and compare various software development life-cycle approaches with risks and benefits of each approach.
MCA-DS-504.2. Understand the requirements for software development and learn the specifications within realistic constraints
MCA-DS-504.3. Understand various software planning and Management techniques for Project scheduling and development.
MCA-DS-504.4. Learn various software design models, design technologies involved in software development.
MCA-DS-504.5. Distinguish between various forms of testing and apply various software testing techniques at the system and organizational level.
MCA-DS-504.6. Understand the issues related to the maintenance and up gradation of the software system.

PART –A

Unit 1: Introduction to Software Engineering

1.1 The software problem
1.2 Software crisis
1.3 Evolution of software engineering
1.4 Principles of software engineering
1.5 Software development vs. software engineering
1.6 Component based software engineering
1.7 Requirements gathering
1.8 Requirements analysis and specification
1.9 Software process

Unit 2: Software Process Models, Project Metrics & Project Management

2.1 Selection of appropriate process model
2.2 Software process models: Waterfall, Spiral, Prototyping, RAD, Agile methodology
2.3 Software project management concepts
2.4 Project planning and control
2.5 Cost estimation using COCOMO model
2.6 Project scheduling using PERT charts, GANTT charts and WBS
2.7 Software metrics: FP, LOC, FP vs. LOC, Token count
2.8 Object-Oriented metrics

Unit 3: Basic Design Issues

3.1 Introduction to software design
3.2 Design objectives

3.3 Design principles
3.4 Design process
3.5 Modularity
3.6 Cohesion
3.7 Coupling
3.8 Function-Oriented software design with DFD and structure chart
3.9 Object-Oriented design
3.10 User interface design

PART -B

Unit 4: Introduction to Testing & Static Testing Techniques

4.1 Some terms: error, mistakes, bug, fault, failure, defects
4.2 Software testing: introduction and definition
4.3 Testing objectives
4.4 Testing process
4.5 Testing lifecycle
4.6 Testing principles
4.7 Software testing team
4.8 Models for software testing
4.9 Test cases designing and writing of test cases: concept & introduction
4.10 Verification & Validation
4.11 Review techniques

Unit 5: Dynamic Testing Techniques & Various Testing Strategies

5.1 Introduction dynamic testing techniques
5.2 Need & advantages
5.3 Functional testing techniques: Equivalence partitioning, BVA, Cause- Effect graphing, Decision table testing
5.4 Structural testing techniques: Coverage testing, Path coverage, Mutation testing
5.5 Unit testing, Integration testing, System testing
5.6 Acceptance testing: Alpha testing & Beta testing
5.7 Usability testing

Unit 6: Types of Testing and Software Quality Assurance

6.1 Regression testing
6.2 Performance testing: load testing & stress testing
6.3 Security testing
6.4 Testing web based Applications
6.5 Definition of quality and factors
6.6 Software quality control
6.7 Software quality assurance Software quality control VS Software quality assurance
6.8 The SEI process Capability Maturity Model (CMM)

Suggested Readings:

1. R. S. Pressman, 2001, Software Engineering: A practitioner's approach, McGraw Hill
2. K.K. Aggarwal & Yogesh Singh, 2007, Software Engineering, New Age International.
3. Sommerville, 2011, Software Engineering, Addison Wesley.

Note: Only latest editions of the books are recommended.

Weblinks:

https://www.tutorialspoint.com
https://www.nptel.ac.in

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

Distribution of Continuous Evaluation Table:

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

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-504.1	2	3	2	3	2	1	2	2	3	1	1	3	2	2
MCA-DS-504.2	2	1	1	3	2	1	2	1	2	1	2	3	2	2
MCA-DS-504.3	2	2	1	3	2	1	1	2	2	1	2	3	2	2
MCA-DS-504.4	2	1	2	3	1	1	2	2	2	1	3	3	2	2
MCA-DS-504.5	1	2	1	2	2	1	2	2	3	1	3	3	2	2
MCA-DS-504.6	2	1	1	2	2	1	1	3	3	1	3	3	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-505: BIG DATA ANALYTICS

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-requisite: Knowledge of Database Management System, Data Warehousing, Java or Python
Course Type: Domain

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

MCA-DS-505.1. Understand the key concepts of Big data management and its associated applications. .
MCA-DS-505.2. Explore the need of Big Data to make better business decisions.
MCA-DS-505.3. Manage big data using NoSQL databases.
MCA-DS-505.4. Apply Map-Reduce programming using Hadoop and related tools.
MCA-DS-505.5. Implement the parallel processing framework using Apache Spark.

PART-A

Unit 1: Introduction Data Mining
1.1 Data Mining Functionalities
1.2 Steps in Data Mining Process
1.3 Architecture of A Typical Data Mining Systems
1.4 Classification of Data Mining Systems
1.5 Overview of Data Mining Techniques

Unit 2: Overview of Big Data
2.1 Basics of Big data
2.2 Reasons for using Big data
2.3 Characteristics of Big Data
2.4 Big Data Architecture: Storing, Selecting and Processing of Big Data
2.5 Applications of Big Data
2.6 Cloud and Big Data

Unit 3: Managing Data with NoSQL
3.1 Introduction of NoSQL Database concepts- ACID Vs. BASE, Advantages, Application
3.2 Schema of NoSQL database
3.3 CAP Theorem: Consistency, Availability and Partition Tolerance
3.4 Sharding and Share Nothing Architecture- Feature Based, Key Based and Lookup Table Based
3.5 Distributed and Decentralised NoSQL databases
3.6 High Availability and Fault Tolerance in NoSQL databases
3.7 Comparison of few NoSQL Databases (Cassandra, Mongo, Cloudera, CouchDB, HBase)

PART-B

Unit 4: Introduction to Hadoop Ecosystem
4.1 Problems with traditional large-scale systems

4.2 Hadoop v/s RDBMS
4.3 Hadoop Distributed File System Design and Architecture
4.4 Building Blocks of Hadoop: NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker
4.5 Map Reduce Framework
4.6 Map Reduce Input and Output Formats
4.7 Introduction to write a MapReduce Program

Unit 5: Querying Big Data with Hive
5.1 Hive Architecture
5.2 Comparison with Traditional Database
5.3 Hive-Data types
5.4 Hive built-in operators and built-in functions
5.5 Hive-Views and Indexes
5.6 Hive QL

Unit 6: Basics of Apache Spark
6.1 Features of Apache Spark
6.2 Hadoop v/s Apache Spark
6.3 Resilient Distributed Dataset (RDD): Introduction of Resilient Distributed Dataset
6.4 Spark RDD operations: RDD Transformation
6.5 Parallel Processing in Spark

Suggested Readings:
1. Tom Plunkett, Brian Macdonald, 2013, Oracle Big Data Handbook, Bruce Nelson, Fujitsu
2. Madhu Jagadeesh, Soumendra Mohanty, Harsha Srivatsa, 2013, Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics: Apress
3. Frank J. Ohlhorst, Big Data Analytics, 2012, Turning Big Data into Big Money, Wiley Publishers
4. Cristian Molaro, Surekha Parekh, Terry Purcell, DB2 11, 2013, The Database for Big Data & Analytics, MC Press
5. Mike Frampton, 2015, Mastering Apache Spark
6. Edward Capriolo, Dean Wampler, Jason Rutyherglen, 2012, O Reilly, Programming Hive

Note: Only latest editions of the books are recommended.

Software required/Weblinks:
http://hadooptutorials.co.in/
https://www.ibm.com/analytics/hadoop/mapreduce
https://www.datacamp.com/community/tutorials/apache-spark-tutorial-machine-learning
http://hadooptutorial.info/category/hive**/**

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

Distribution of Continuous Evaluation Table:

Sessional-I	30%
Sessional-II	30%

Assignment	20%
Class performance	10%
Attendance	10%

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-505.1.	1	1	1	1	1		1						1	1
MCA-DS-505.2.	1	1	1	1	1		1						2	2
MCA-DS-505.3.	2	2	3	3	3		3						3	3
MCA-DS-505.4.	3	3	3	3	3		3						3	3
MCA-DS-505.5.	3	3	3	3	3		3						3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-506: CLOUD COMPUTING

Periods/week	Credits	Max. Marks : 200
L: 3 T: 0	3	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of Data Communication & Networking
Course Type: Domain

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

MCA-DS-506.1 Define cloud computing and memorize the different cloud services and deployment models.

MCA-DS-506.2 Describe importance of virtualization along with their respective technology.

MCA-DS-506.3 Use and examine different cloud computing services.

MCA-DS-506.4 Analyze and compare various different cloud computing platforms such as AWS, Microsoft Azure.

MCA-DS-506.5 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

1.1 Cloud Models: Deployment models, Service Models
1.2 Cloud reference model (Architecture, Infrastructure, Platform, and Software)
1.3 Cloud types (Public, Private, Hybrid & Community clouds) with examples
1.4 Exploring cloud computing status; Connecting to cloud
1.5 Cloud Computing Technologies: Elasticity, Load Balancing
1.6 Open Challenges

UNIT 3: Cloud Delivery Models

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

PART-B

UNIT 4: Cloud Security and Trust Management

4.1 An Introduction to the Idea of Data Security
4.2 Cloud Security Threats

4.3 The Current State of Data Security in the Cloud CryptDb
4.4 Onion Encryption layers and Homomorphic Encryption
4.5 Trust, Reputation and Security Management

UNIT 5: Cloud Platforms in Industry
5.1 Amazon Web Services
5.2 Google AppEngine
5.3 Microsoft Azure
5.4 Manjra Soft Aneka
5.5 Hadoop

Unit 6: Cloud Applications
6.1 Scientific Applications
6.2 Business Applications
6.3 Consumer Applications
6.4 Third Party Cloud Services
6.5 Case Study related to cloud environment

Suggested Readings:

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

Note: Only latest editions of the books are recommended.

Web links:

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

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-506.1	2		1	1			2						3	3
MCA-DS-506.2	1	3	1		1		1						2	2
MCA-DS-506.3	1	2	2	2		2	1						2	3
MCA-DS-506.4	1	2	2	2	3	2	1						3	2
MCA-DS-506.5	2	3	2	2		2	2	1					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-507: NETWORK SECURITY AND CRYPTOGRAPHY

Periods/week	Credits		Max. Marks	: 200
L: 2 T: 0	2		Continuous Evaluation	: 100
Duration of Examination: 3 Hrs			End Semester Examination	: 100

Pre-Requisite: Knowledge of Networking
Course Type: Domain Elective

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

MCA-DS-507.1 Analyze the basic concepts of network security.
MCA-DS-507.2 Recognize various security threats, their harm, strategies and tactics to protect the networks
MCA-DS-507.3 Explore various aspects of network security and access control mechanism
MCA-DS-507.4 Appraise the concept of encryption and decryption keys and to explain the various types of cipher.
MCA-DS-507.5 Relate existing symmetric key algorithm like Data Encryption Standard.
MCA-DS-507.6 Elaborate the concepts of authentication, digital signature & cryptography

PART- A

Unit 1: Security Fundamentals
4.6 Overview of Security
4.7 Protection versus Security
4.8 Goals and Aspects of Security
4.9 Data Integrity
4.10 Data Availability and Privacy
4.11 Security Problems
4.12 User Authentication

Unit 2: Security Threats
5.1 Program Threats
5.2 Worms, Viruses, Trojan Horse, Trap Door
5.3 Stack and Buffer Overflow
5.4 System Threats- intruders
5.5 Communication Threats- Tapping and Piracy
5.6 Firewalls
5.7 Security Methodology-The Three D's of Security
5.8 Strategy and Tactics
5.9 Website Attacks: SQILA, XSS, LDAP, Injection Attack

Unit 3: Network Security and Access Control
6.1 Risk Analysis and Defense Models
6.2 Network Segmentation
6.3 Access Control
6.4 Physical Security
6.5 Security Assets (Locks, Entry Controls)
6.6 Physical Intrusion Detection

6.7 Authentication and Authorization Controls

PART-B

Unit 4: Encryption Techniques
4.1 Substitution Ciphers
4.2 Transposition Ciphers
4.3 Stream and Block Ciphers
4.4 Symmetric-key Algorithms, Asymmetric-key Algorithms
4.5 Data Encryption Standard
4.6 Advanced Encryption Standards
4.7 Public Key Encryption – RSA
4.8 Message Integrity and Authentication- MAC, Hash functions

Unit 5: Digital Signatures
5.1 Introduction to Digital Signatures
5.2 Symmetric Key Signatures
5.3 Public Key Signatures
5.4 Message Digests
5.5 Public Key Infrastructures.

Unit 6: Mathematics of Cryptography
6.1 Integer Arithmetic (Extended Euclidean Algorithm, Linear Diophantine Equation)
6.2 Modular Arithmetic (Additive & Multiplicative Inverse)
6.4 Linear Congruence.
6.5 Algebraic Structures ((Groups; Rings; Fields)
6.6 GF (2n) Fields
6.7 Chinese Remainder Theorem
6.8 Quadratic Congruence
6.9 Exponention and Logarithm

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. Rhodes-Ousley, Network security, 2017,The Complete Reference, Tata McGraw-Hill
4. A. Forouzan, 2010, Cryptography & Network Security, Tata McGraw Hill

Note: Only latest editions of the books are recommended.

Software required/ Web links:

http://www.inf.ufsc.br/~bosco.sobral/ensino/ine5680/material-cripto-seg/2014-1/Stallings/Stallings_Cryptography_and_Network_Security.pdf
https://www.tutorialspoint.com/network_security/
http://learnthat.com/introduction-to-network-security/6/

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-507.1	2	1		2			2						3	3
MCA-DS-507.2	1	3	1	1			2						2	2
MCA-DS-507.3	1	2	1	1			2						2	3
MCA-DS-507.4	1	2	2	3	2		1						3	2
MCA-DS-507.5	2	1	1	3	2		2						2	2
MCA-DS-507.6	1	1	1		2	2	2						2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-508: DATABASE ADMINISTRATION

Periods/week Credits — Max. Marks : 200
L: 2 T: 0 2 — Continuous Evaluation: 100
Duration of Examination: 3 Hrs — End Semester Examination : 100

Pre-Requisite: Knowledge of Database Management System
Course Type: Domain Elective

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

MCA-DS-508.1 Identify the importance of Database Administration and role of its administrator.
MCA-DS-508.2 Acquire knowledge on cloud databases and its applications.
MCA-DS-508.3 Transform an information model into a relational database schema with Oracle.
MCA-DS-508.4 Analyze strategies for managing data security, privacy, fraud detection, backup and recovery.
MCA-DS-508.5 Implement techniques for controlling the consequences of concurrent data access.

PART - A

UNIT 1: Database Administration and its Interface

1.1 Database Management System and its Architecture
1.2 Database Models – Implementation of Object Oriented Database Model
1.3 Database Administration and its scope
1.4 Roles and Responsibilities of Database Administrator
1.5 Working knowledge of Database Administrative tasks
1.6 Data Dictionary Reports
1.7 Database Schemas
1.7.1 Internal Schema
1.7.2 External Schema
1.7.3 Storage Schema
1.8 Enterprise Manager Tour

UNIT 2: Oracle : Installation and Architecture

2.1 Oracle Installation
2.2 General Oracle Database Architecture
2.3 Optimal Flexible Architecture (OFA)
2.4 Managing Oracle Memory
2.5 Memory Structure of Oracle
2.6 Instance Memory
2.7 System Global Area
2.8 Program Global Area
2.9 Instance Background Processes
2.10 SQL Execution Processes

UNIT 3: Database Storage Structures

3.1 Tablespaces : Introduction and Architecture
3.2 Tablespaces Management in Database
3.3 Types of Tablespaces : Temporary and Permanent

3.4 Tablespaces Manipulation : Create, Alter, Drop
3.5 Managing Data Files
3.6 Managing Temp Files
3.7 UNDO_MANAGEMENT
3.8 UNDO_TABLESPACE
3.9 UNDO_RETENTION

PART-B

UNIT 4: Virtual and Cloud Based Oracle Server and Services

4.1 Oracle in Cloud
4.2 Managing online and Offline Database
4.3 Database Architecture on Cloud
4.4 Logical and Physical Database Layout on Cloud
4.5 Types of Oracle Services
4.6 Different types of Servers used in Oracle
4.7 Oracle Cloud : Enterprise Cloud Computing SaaS, IaaS, PaaS
4.8 Difference between Public, Private and Hybrid Cloud

UNIT 5: Database Security

5.1 Introduction to Database Security
5.2 Problems in Database Security and Conclusions
5.3 Security Models
5.4 Security Mechanism
5.5 Security Software Design
5.6 Database Object Privileges
5.7 Administrative Auditing of Database Activity
5.8 Enhanced Default Security Settings
5.9 Backup and Recovery Procedures
5.10 Rollback Segments
5.11 Roll Based Security

UNIT 6: Managing Concurrency and Locks

6.1 Concurrency Control Protocols
6.2 Lock Based Protocols and its Types
6.3 Timestamp based Protocols
6.4 ACID Properties of Database
6.5 Deadlock and Deadlock Prevention
6.6 Catastrophic Failure and Avoidance
6.7 Data Recovery
6.8 Recovery Classifications
6.9 Recovery and Atomicity

Suggested Readings:

1. Jonathan Gennick & Carol McCillough-Dieter, 2000, Oracle 8i DBA Bible, IDG Books Worldwide
2. Kevin Loney, 2001, Oracle 9i DBA Handbook, Oracle Press/Osbourne
3. Bob Bryla, 2006, Oracle 9i DBA Fundamental, BPB Publications
4. Greenwald, 2007, Oracle Essentials: Oracle Database 11g, Penguin's Book Ltd

Note: Only latest editions of the books are recommended.

Software required/ Web links:
Oracle 9i or above versions (10g, 11i,12c)
https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm
https://www.tutorialspoint.com/html/index.htm
https://www.w3schools.com/

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

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Assessment Tools:
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Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-508.1		1	2	2	1	2		1			3		3	2
MCA-DS-508.2	1	2	2	3	3				2	2	1		2	1
MCA-DS-508.3	1	1	2	1		2		2		3	2	2	2	2
MCA-DS-508.4	1	1	2		3		3	3	3	1		3	2	1
MCA-DS-508.5		2	2	3		3							2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-509: E-COMMERCE TECHNOLOGIES

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

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

Pre-Requisite: Knowledge of Internet
Course Type: Domain Elective

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

MCA-DS-509. 1: Understand the fundamentals and importance of E-Commerce.
MCA-DS-509.2: Classify trading relationships including Business to Consumer, Business-to-Business, Inter-organization.
MCA-DS-509.3: Interpret the key features of Internet, Intranets and Extranets by demonstrating their relation with each other.
MCA-DS-509.4: Analyze the major security challenges in using and making On-line transactions.
MCA-DS-509.5: Examine the legal issues and Privacy in E-Commerce.
MCA-DS-509.6: 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, Theodre H K Clark, 2001, Global Electronic Commerce-Theory and case studies, University Press
3. G.S.V Muthy, 2019, E-Commerce Concepts, Models, Strategies, Himalaya Publications
4. Chan, 2001, E-Commerce, Fundamentals and Applications, Wiley Publications

Note: Only latest editions of the books are recommended.

Web Links:

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

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

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Sessional-I	30%
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Assessment Tools:
Assignment/Tutorials
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Surprise questions during lectures/Class Performance
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COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-509.1			1		2	3	1	1	1				1	1
MCA-DS-509.2		1	1		2	2	1			2		1	1	
MCA-DS-509.3		1	1	1	1	2	1		1	1			1	1
MCA-DS-509.4		1			1	2	1			1	2		1	1
MCA-DS-509.5		1	1		1	2	1			1	1		1	
MCA-DS-509.6	1	1			1	2	1	1		1	1	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUE OF RESEARCH & STUDIES

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

MCA-EC-401: Security Operations Analyst Associate

Periods/week	Credits	Max. Marks: 200
L: 2 T:0	2	Continuous Evaluation: 100
Duration of Examination: 3 Hrs		End Term Examination: 100

Pre-Requisite:: Fundamental understanding of Microsoft security, compliance, and identity products
Course Type: Domain Specific
Course Outcomes: At the end of the course, the student will be able to:
MCA-EC-401.1 Knowledge of Microsoft Defender for Endpoint and Identity can remediate risks in your environment
MCA-EC-401.2 Configure alert settings, Attack Surface Reduction rules, conduct hunting on Windows devices
MCA-EC-401.3 To work with KQL database security.
MCA-EC-401.4 Connect Azure Windows Virtual Machines to Microsoft Sentinel
MCA-EC-401.5 Manage a Microsoft Sentinel workspace

PART -A

Unit 1- Mitigate threats using Microsoft 365 Defender

1.1 Introduction to Microsoft 365 threat protection
1.2 Mitigate incidents using Microsoft 365 Defender
1.3 Protect your identities with Azure AD Identity Protection
1.4 Remediate risks with Microsoft Defender for Office 365
1.5 Safeguard your environment with Microsoft Defender for Identity
1.6 Secure your cloud apps and services with Microsoft Defender for Cloud Apps
1.7 Respond to data loss prevention alerts using Microsoft 365
1.8 Manage insider risk in Microsoft 365
1.9 Mitigate threats using Microsoft 365 Defender

Unit 2- Mitigate threats using Microsoft Defender for Endpoint

2.1 Protect against threats with Microsoft Defender for Endpoint
2.2 Deploy the Microsoft Defender for Endpoint environment
2.3 Implement Windows security enhancements with Microsoft Defender for Endpoint
2.4 Perform device investigations in Microsoft Defender for Endpoint
2.5 Perform actions on a device using Microsoft Defender for Endpoint
2.6 Perform evidence and entities investigations using Microsoft Defender for Endpoint
2.7 Configure and manage automation using Microsoft Defender for Endpoint
2.8 Configure for alerts and detections in Microsoft Defender for Endpoint
2.9 Utilize Vulnerability Management in Microsoft Defender for Endpoint
2.10 Deploy Microsoft Defender for Endpoint
2.11 Mitigate Attacks with Microsoft Defender for Endpoint

Unit 3- Mitigate threats using Microsoft Defender for Cloud

3.1 Plan for cloud workload protections using Microsoft Defender for Cloud
3.2 Connect Azure assets to Microsoft Defender for Cloud
3.3 Connect non-Azure resources to Microsoft Defender for Cloud
3.4 Manage your cloud security posture management
3.5 Explain cloud workload protections in Microsoft Defender for Cloud
3.6 Remediate security alerts using Microsoft Defender for Cloud
3.7 Mitigate threats using Microsoft Defender for Cloud

PART B

Unit 4- Create queries for Microsoft Sentinel using Kusto Query Language (KQL)

4.1 Construct KQL statements for Microsoft Sentinel
4.2 Analyze query results using KQL
4.3 Build multi-table statements using KQL
4.4 Work with data in Microsoft Sentinel using Kusto Query Language
4.5 Create queries for Microsoft Sentinel using Kusto Query Language (KQL)

Unit 5- Configure and Connect with Microsoft Sentinel

5.1 Introduction to Microsoft Sentinel
5.2 Create and manage Microsoft Sentinel workspaces
5.3 Query logs in Microsoft Sentinel
5.4 Use watchlists in Microsoft Sentinel
5.5 Utilize threat intelligence in Microsoft Sentinel
5.6 Configure your Microsoft Sentinel environment
5.7 Connect data to Microsoft Sentinel using data connectors
5.8 Connect Microsoft services to Microsoft Sentinel
5.9 Connect Microsoft 365 Defender to Microsoft Sentinel
5.10 Connect Windows hosts to Microsoft Sentinel
5.11 Connect Common Event Format logs to Microsoft Sentinel
5.12 Connect syslog data sources to Microsoft Sentinel
5.13 Connect threat indicators to Microsoft Sentinel
5.14 Connect logs to Microsoft Sentinel

Unit 6- Connect Azure Windows Virtual Machines to Microsoft Sentinel

6.1 Threat detection with Microsoft Sentinel analytics
6.2 Automation in Microsoft Sentinel
6.3 Threat response with Microsoft Sentinel playbooks
6.4 Security incident management in Microsoft Sentinel
6.5 Identify threats with Entity behavior analytics in Microsoft Sentinel
6.6 Data normalization in Microsoft Sentinel
6.7 Query, visualize, and monitor data in Microsoft Sentinel
6.8 Manage content in Microsoft Sentinel
6.9 Create detections and perform investigations using Microsoft Sentinel
6.10 Threat hunting concepts in Microsoft Sentinel
6.11 Threat hunting with Microsoft Sentinel
6.12 Use Search jobs in Microsoft Sentinel
6.13 Hunt for threats using notebooks in Microsoft Sentinel
6.14 Threat hunting in Microsoft Sentinel

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

Distribution of Continuous Evaluation Table

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS02
MCA-EC-401.1	1	2	3	3			2	3					1	
MCA-EC-401.2	1	2	2	3	2		3	3					1	
MCA-EC-401.3	1	2	3	3	2		3	3					2	2
MCA-EC-401.4	1	2	2	3	2		2	3					1	
MCA-EC-401.5	1	2	2	3	2		3	3					3	

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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MCA-DS-552: ADVANCE DATABASE SYSTEMS LAB

Periods/week Credits — Max. Marks : 100
P: 4 T:0 2 — Continuous Evaluation: 50
Duration of Examination: 3 Hrs — End Semester Examination: 50

Co-Requisite: Knowledge of Database Management System
Course Type: Core
Course Coordinator/ Co-Coordinator: Ms Neerja Negi

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

MCA-DS-552.1 Implement advanced SQL Commands.
MCA-DS-552.2 Apply clauses and different joins on multiple tables to develop the relationships.
MCA-DS-552.3 Demonstrate the PL/SQL architecture, program structure, conditional, loop statements, procedures, functions and packages.
MCA-DS-552.4 Experiment the concepts of triggers, cursor management and exception handling in PL/SQL
MCA-DS-552.5 Develop a project for real time applications.

List of Experiments:
Every student is required to maintain Practical File and write the following steps in each practical:
1. Problem statement
2. Formula(s) used
3. Syntax
4. Queries
5. Program listing (print-out)
6. Input & Output.

Q1. Create tables Employee and Department

Column_name	Data type	Size	Constraint
EmpNo	Number	4	Primary Key
Empname	Varchar2	20	Not null
Address1	Varchar2	25	
Job	Varchar2	15	
Hiredate	Date		
Salary	Number	9,2	Check > 15000
Comm	Number	7,2	
DeptNo	Number	2	Not null

Department:

Column_name	Data type	Size	Constraint
DeptNo	Number	2	Primary Key
Dname	Varchar2	20	
Location	Varchar2	10	

2. Insert five records for each table.
3. List all information about all employees from employee table
4. List all employee numbers along with their salary.
5. List department names and locations from the department table
6. List the employees belonging to department 20
7. List the names of analysts and salesman.
8. List the employee names not belonging to the department 10, 40.
9. List the employee names who are not eligible for commission.
10. List the employees whose names start with "S" not s.
11. List the names, salary and PF amount of all the employees (PF is calculated as 10% of salary)
12. List the employee names having "k" as the second character.
13. List the employee details in ascending order of salary
14. List the maximum and minimum salary from the employee and rename with "Max_Sal" and Min_Sal".
15. List the department number and the total salary payable in each department.
16. List the jobs and the number of employees in each job. The result should in descending order of the number of employees.
17. Write a PL/SQL block to calculate total salary of employee having employee number 100.
18. Write a PL/SQL code to find the greatest of three numbers.
19. Write a PL/SQL code to print the numbers from 1 to n.
20. Write a PL/SQL code to reverse a string using for loop.
21. Write a PL/SQL code to find the sum of n numbers.
22. Write a PL/SQL block to show the use of Elsif ladder.
23. Consider a PL/SQL code to display the empno, ename, job of employees of department number 10 (using cursor).
24. Consider a PL/SQL code to display the employee number & name of top five highest paid employees.
25. Consider a PL/SQL code to calculate the total salary of first n records of employee table. The value of n is passed to cursor as parameter using for loop.
26. Consider a PL/SQL procedure that accepts 2 numbers & return addition, subtraction, multiplication & division of two numbers using stored procedure and local Procedure.
27. Consider a PL/SQL code that accepts 2 numbers & return addition, subtraction, multiplication & division of two numbers using stored functions.
28. Consider a PL/SQL code that accepts 2 numbers & return addition, subtraction, multiplication & division of two numbers using local functions.

29. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

a) Online Grievance Redressal System

Online Grievance Redressal System is a project which is created to bring transparency and flexibility in the administration system. This system is a online platform where people can share ideas, invoke discussion, issue complaints and create suggestion/petitions for the improvement of the city administration. This application is a automated process which is a user-friendly online interface for the citizens. All data related to the application would be saved in Oracle Database and can be viewed online.

b) Internet Content Filtering Tool

The Internet Content Filtering project will be developed using Oracle and any front end tool. The application has the same working principles of a proxy server. The project will have the aim to promote safer use of the Internet and new online technologies, particularly for children, and to fight against illegal content and content unwanted by the end-user.

c) Intelligent Business Process System

This project is a client server based administrative software utility to manager and automates various processes taking place in a business processing and outsourcing company mainly focused on data conversion. It consists of three software components, Server Manager, Client Assistant, QC Assistant. Each component can operate independently and can communicate with each other using TCP/IP Protocol. The three components of the IBPM operate accordingly to coordinate the various process-taking places in a BPO firm.

Suggested Readings:

1. Elmasri and Navathe, 2016, Fundamentals of Database Systems, Pearson Education
2. Raghu Ramakrishnan, 2003, Database Management Systems, Johannes Gehrke, , McGraw-Hill
3. Korth, Silberchatz, Sudarshan, 2011, Database System Concepts, McGraw-Hill.
4. Peter Rob and Coronel, 2010, Database Systems, Design, Implementation and Management, Thomson Learning.
5. C. J. Date & Longman, 2003, Introduction to Database Systems, Pearson Education

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Oracle 9i or above versions (10g, 11i, 12c)
https://www.geeksforgeeks.org/dbms-concurrency-control-protocols-lock-based-protocol/
https://www.tutorialspoint.com/dbms/dbms_data_recovery.htm
https://www.tutorialspoint.com/html/index.htm
https://www.w3schools.com/

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-552.1		1	2	3				2			3		3	2
MCA-DS-552.2	1	2	2	3	3				2		3		2	1
MCA-DS-552.3	1	1	2		1		3	2				3	2	1
MCA-DS-552.4	1	1	2		2								2	1
MCA-DS-552.5	2	2	2	3	3				2			3	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-553: .NET LAB

Periods/week Credits	Max. Marks : 100
P: 4 T: 0 2	Continuous Evaluation: 50
Duration of Examination: 3 Hrs	End Semester Examination : 50

Co-requisite: Knowledge of Object oriented programming approach
Course Type: Core

Course Outcomes: After completing this course, the student will be able to

MCA-DS-553.1 Understand and explain the windows application programming concepts.
MCA-DS-553.2 Identify the different tools and controls used in the programming.
MCA-DS-553.3 Explore the concept of Objects and classes to be used in C#.
MCA-DS-553.4 Learn advanced concepts like file handling and event handling in C#
MCA-DS-553.5 Demonstrate the basic concepts of database connectivity with visual studio .net
MCA-DS-553.6 Implement the object oriented concepts in C#.

1. Revision of Basic programming techniques using C#.

2. Implement the Concept to C# that inputs a positive integer n and then prints a triangle of asterix n times high and 2n-1 column wide. For example If input is 5 then the output would pyramid.

3. Implement the concept of bubble sort in C#.

4. Create two classes DF & DM distance in Cm & m. Implement the Concept to read the dimensions in one of these metrics & convert them to other & display the same.

5. Implement the concept of a class to represent a Bank Account comprising the given specifications & concept of member functions.

6. Implement the concept of file handling to read XML file and display all the values in a read only Form.

7. Concept of three variables: temp, pressure and water level for a chemical industry boiler from the keyboard. Throw an event called alert, if these variables level shoot above a certain level. [Event Handling]

8. Concept to illustrate overloading an indexer.

9. Implement the concept in C# consisting of a delegate called student that refers to a method called student record (), your program should get the details of student record and display. [Delegate]

10. Develop the Concept to create a class that does metric conversion from meters, centimeter to feet, inches respectively. Create a class called meters.txt and read the data from the user by prompting. Convert this data into feet and inches and save it in another file called feet.txt. [File Handling]

11. Prepare a login form, which will accept unique username, password of alphanumeric type, re-type password, date of birth, and text to remember password. And put all necessary validation. If user does not fill the complete form it should show valid error message. Also if user is new then there should be option for creating new Login and a checkbox to remember on computer. [Windows application].

12. Prepare & develop the concept of with Menu Bar, Context Bar and Tool Bar.

13. Prepare a ASP.NET page to fill student details. Use any of the components available as deemed fit for the requirements. on the press of save button user should be able to save the form data in a mysql table .

14. Develop an ASP page to display the data of students entered in the previous form in tabular format using any of the grids .use Dataset to populate the grid.

15. Create a ASP.NET page to fill student details. Use any of the components available as deemed fit for the requirements. on the press of save button user should be able to save the form data in a mysql table .

16. Create an ASP page to display the data of students entered in the previous form in tabular format using any of the grids. Use Dataset to populate the grid.
17. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

a. Student Tracking System
b. Mobile Wallet
c. Toll Collection
d. Asset Tracking System
e. Feedback system

Suggested Reading:

1. Daniel M. Solis, 2010, Illustrated C#, Apress Publications
2. Jack Purdum, 2007, Beginning C# 3.0 An introduction to object oriented programming, Wrox Publication
3. Jon Skeet, 2008, C# in depth, Manning Publications Co.
4. Matthew McDonald, 2010, Beginning ASP.NET 4 in C#, Apress Publications
5. Imar Spaanjaars, 2010, Beginning ASP.NET 4.5 in C# and VB,Wrox Publications

Note: Only latest editions of the books are recommended.

Software required/ Web links:

Visual Studio 2010
Database Server: SQL Server 2008
https://docs.microsoft.com/en-us/dotnet/csharp/quick-starts/
https://www.tutorialspoint.com/csharp/

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-553.1	2		2	2	3	2			1				2	1
MCA-DS-553.2	2	2	2		3		1	1	1				3	1
MCA-DS-553.3	2		2	2	3	1	1			2			2	2
MCA-DS-553.4	2		2		3	2	1	1		2		1	2	2
MCA-DS-553.5	2	2	2		3	2		1		2	1	1	2	3
MCA-DS-553.6	2	2	2		3	2	1			1	1		2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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

MCA-DS-555: BIG DATA ANALYTICS LAB

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

Co-requistie:

Course Type: Domain Specific Elective

Course Outcomes:

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

MCA-DS-555.1. To acquire fundamental enabling techniques and scalable algorithms such as NO SQL.
MCA-DS-555.2. To analyze and integrate machine learning libraries, mathematical and statistical tools with modern technologies like mapreduce.
MCA-DS-555.3. To solve problems associated with big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issue.
MCA-DS-555.4. To implement machine learning techniques and computing environment that are suitable for the real time applications such as recommender system.

List of Practicals

1. Installation of VMWare to setup the Hadoop environment and its ecosystems.
2. Perform setting up and Installing Hadoop in its three operating modes. i. Standalone. ii. Pseudo distributed. iii. Fully distributed.
3. Prototype Designing
4. Simulation based implementation
5. Use web based tools to monitor your Hadoop setup.
6. Implementing the basic commands of LINUX Operating System – File/Directory creation, deletion, update operations.
7. Implement the following file management tasks in Hadoop:
   i. Adding files and directories
   ii. Retrieving files
   iii. Deleting files
   iv. Creating and destroying files
8. Write a Word Count Map Reduce program to understand Map Reduce Paradigm.
9. Optimization of Codes
10. Write a Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.
11. Implement Matrix Multiplication with Hadoop Map Reduce
12. Download MongoDB and analyse its client and server working.
13. Create a database in MongoDB and apply CRUD operations.
14. Download Hive.
15. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes .
16. Download Apache Spark, python libraries, open source libraries and implement python programs in spark.

17. How MongoDB associated with other coding languages
18. Android and IoS integrated with Big Data.
19. Implement word count problem using pyspark.

Suggested Readings:

1. Tom Plunkett, Brian Macdonald, Bruce Nelson, Fujitsu,2013, Oracle Big Data Handbook, Oracle Press
2. Madhu Jagadeesh, Soumendra Mohanty, Harsha Srivatsa, 2013, Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics, Apress
3. Frank J. Ohlhorst, 2012, Big Data Analytics: Turning Big Data into Big Money, Wiley Publishers
4. Cristian Molaro, Surekha Parekh, Terry Purcell, 2013, DB2 11: The Database for Big Data & Analytics, MC Press
5. Mike Frampton, 2015, Mastering Apache Spark, PACKT Publishers
6. Edward Capriolo, Dean Wampler, Jason Rutyherglen, 2012, Programming Hive, O Reilly

Software required/weblinks:

http://hadooptutorials.co.in/
https://www.ibm.com/analytics/hadoop/mapreduce
https://www.datacamp.com/community/tutorials/apache-spark-tutorial-machine-learning
http://hadooptutorial.info/category/hive**/**

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-555.1	2	2	3	3	3		3						3	3
MCA-DS-555.2	3	3	3	3	3		3						3	3
MCA-DS-555.3	3	3	3	3	3		3						3	3
MCA-DS-555.4	2	3		3	3		2						3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-556: CLOUD COMPUTING LAB

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

Co-Requisite: Cloud Computing
Course Type: Domain Specific

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

MCA-DS-556:1. Define Git and Docker cloud computing tools.
MCA-DS-556:2. Understand cloud oriented AmazonEC2 services.
MCA-DS-556:3. Extend the Microsoft azure services for mobile and desktop.
MCA-DS-556:4. Determine the services of Hadoop and understand its features.
MCA-DS-556:5. Apply the open source cloud using google app engine.
MCA-DS-556:6. Implement Cloud Virtualization using vmware, aws and azure.

List of Experiments:

1. Create account on github.com and install gitbash on machine.
2. Install docker from docker-hub on the machine.
3. Create and configure virtual machines using VMware.
4. Create a virtual machine in Microsoft windows using AWS.
5. Connect EC2 Linux Instance Using PuTTy and run basic linux commands on it.
6. Create and configure Elastic Load Balancer and perform live migration.
7. Create docker-image for simple program.
8. Manage virtual machines with Red Hat Network.
9. Create the containers and manage blobs in cloud environment using Microsoft Azure.
10. Create a spreadsheet using google drive.
11. Install Google App Engine. Create hello world app and other simple web applications using python/java.
12. Create and deploy an application using google app engine.
13. Create encryption and decryption script using Microsoft Azure Key Valut
14. Create backup script with Azure VMs.
15. Create recovery scripts using Azure VMs.
16. Deploy OpenStack Single Node with OpenStackCompte (Nova), OpenStak Identity (Keystone) and OpenStack Dashboard (Horizon) .

17. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
18. Show the virtual machine migration based on the certain condition from one node to the other.
19. Find procedure to set up the one node Hadoop cluster.
20. Mount the one node Hadoop cluster using FUSE.
21. Write a program to use the API's of Hadoop to interact with it.
22. Write a word count program to demonstrate the use of Map and Reduce task

Case Studies:

1. As Amazon.com grows larger, the sizes of their Oracle databases continue to grow, and so does the sheer number of databases they maintain. This has caused growing pains related to backing up legacy Oracle databases to tape and led to the consideration of alternate strategies including the use of Cloud services of Amazon Web Services (AWS), a subsidiary of Amazon.com, so maintain reliable backups and being fast and efficient when retrieving data. DBAs have to evaluate whether Amazon S3 backups would be viable for their database backups.
2. In Microsoft Azure, a server takes lot of time to upload a file, so create some function or macro to reduce the file uploading time on Azure.
3. Devevelop a Hadoop-based cloud computing application that pro-cesses sequences of microscope images of live cell.
4. Organize a case in Aneka / Eucalyptus for simulation entities in run-time using a its toolkit support and manage virtual cloud.

Suggested Readings:

1. K Jamsa, 2012, Cloud Computing Saas, Paas, Iaas, Virtualization, Business Models & More, Jones & Bartlett Learning
2. B Rajkumar, V Christian, S. ThamaraiSelvi, 2013, Mastering Cloud Computing, TMH Education
3. B Sosinky, 2011, Cloud Computing Bible, Wiley Publication

Note: Only latest editions of the books are recommended.

Web links:

https://aws.amazon.com/what-is-cloud-computing/
http://www.manjrasoft.com/aneka_architecture.html/
http://uir.ulster.ac.uk/20675/3/ijacivol3no1.pdf /
https://en.wikipedia.org/wiki/Point_of_delivery_%28networking%29/
https://www.techopedia.com/definition/25939/silo/
https://github.com/
https://hub.docker.com

Assessment Tools:

Assignments
Sessional tests
Surprise questions during labs/Lab Performance
End Semester examination

Distribution of Continuous Evaluation Table:

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-556.1	1	1	3	3	1	1	1	1			2	1	1	2
MCA-DS-556. 2	1	1	3	3	1	1	1	1			2	1	1	2
MCA-DS-556.3	1	1	3	3	1	1	1	1				1	1	2
MCA-DS-556.4	1	1	3	3	1	1	1	1				1	1	2
MCA-DS-556.5	1	1	3	3	3	1	1	3			3	1	1	3
MCA-DS-556. 6	1	1	3	3	3	1	1	2			3	1	1	2

SEMESTER IV

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
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MCA-DS-601: ADVANCE JAVA

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Evaluation : 100
Duration of Examination: 3 Hrs		End Semester Examination: 100

Pre-Requisite: Knowledge of Core java
Course Type: Core

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

MCA-DS-601.1. Define sophisticated and interactive user interfaces using the Java Swing class.
MCA-DS-601.2.Understand about Java server Pages (JSP) technology.
MCA-DS-601.3. Implement the server side programming using advanced java tools.
MCA-DS-601.4. Evaluate the mapping of Java classes and objects associations to the relational database tables.
MCA-DS-601.5. Design a solution for a real world problem using advanced concept of Java Programming.

PART-A

UNIT 1: Java Database Connectivity (JDBC)
1.1 Overview of RDBMS
1.2 Introduction to Call Level Interface(CLI)
1.3 Introduction to JDBC
1.4 JDBC Architecture
1.5 Types of JDBC Drivers
1.6 Establishing a JDBC Connection
1.7 Managing Transactions in JDBC

UNIT 2: Extensible Markup Language (XML)
2.1 Extensible Markup Language (XML)
2.2 Document Object Model (DOM)
2.3 Understanding DOM
2.4 Using DOM in Java
2.5 StAX in Java
2.6 Understanding StAX
2.7 Programming with StAX

UNIT 3:Java Servlets
3.1 Introduction to CGI and Servlets
3.3 Lifecycle of a Servlets
3.4 JSDK servlet API
3.5 javax.servlet package
3.6 Reading servlet and initialization parameters
3.7 javax.servelet HTTP package,
3.9Handling Http Request & Responses
3.10 Cookies-Session Tracking, Security Issues

PART-B

UNIT 4: Java Server Pages (JSP)

4.1 Introduction to JSP
4.2 Problem with Servelet
4.3 Anatomy of a JSP Page
4.5 JSP Processing.
4.6 JSP Application Design with MVC Setting Up
JSP Environment: Installing the Java Software Development Kit
4.7 Tomcat Server & Testing Tomcat

UNIT 5: Enterprise Java Beans

5.1 Introduction to Enterprise Java Beans
5.2 EJB – Environment Setup.
5.3 EJB – Create Application
5.4 EJB – Stateless Bean
5.5 EJB – Stateful Bean
5.6 EJB – Persistence
5.7 EJB – Message Driven Beans
5.8 EJB – Exception Handling.
5.9 EJB – Web Services

UNIT 6: **JSP Expression Language (EL)**

6.1 Syntax
6.2 Implicit objects
6.3 Operators
6.4 Control Structures
6.5 Functions

Suggested Readings:

1. ED Roman, Rima Patel, 2014, Mastering Enterprise Java Beans, Wiley Publishing Inc.
2. Uttam Roy, 2015, Advanced Java Programming ,Oxford University Press
3. Murach, 2005, Murach's beginning JAVA JDK 5, SPD
4. Knuckles, 2005, Web Applications Technologies Concepts, John Wiley.
5. Pekowsky, 2004, Java Server Pages, Pearson publication

Note: Only latest editions of the books are recommended.

Web links:

https://www.tutorialspoint.com/jdbc
https://www.javatpoint.com/java-jdbc
https://www.w3schools.com/xml/
https://www.javatpoint.com/servlet-tutorial
https://www.guru99.com/jsp-tutorial.html
https://www.tutorialspoint.com/jsp/jsp_expression_language.htm
https://www.tutorialspoint.com/ejb/ejb_tutorial.pdf

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
MCA-DS-601.**1**	3	3	2	2				2			2		3	3
MCA-DS-601.**2**	3	3	2	2									3	2
MCA-DS-601.**3**	3	3	3	2	3		1				2		3	3
MCA-DS-601.**4**	2	3	2	3	2			2			2		2	2
MCA-DS-601.**5**	3	3	2	3	2			2			2		3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-602: SOFTWARE PROJECT MANAGEMENT

Periods/week Credits	Max. Marks : 200
L: 3 T: 1 4	Continuous Evaluation : 100
Duration of Examination: 3 Hrs	End Semester Examination : 100

Pre-Requisite: Knowledge of computer hardware, software and computer networks
Course Type: Core

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

MCA-DS-602.1. Monitor & control software project development.
MCA-DS-602.2. Perform quality audits of software projects.
MCA-DS-602.3. Examine quality control and quality assurance aspect of software project.
MCA-DS-602.4. Analyze the process to outsource the project and ensuring quality.
MCA-DS-602.5. Create Gantt Chart and PERT chart.
MCA-DS-602.6. Develop project plan and cost estimation.

PART- A

UNIT 1: Introduction to Software Project Management
1.1 Introduction to project management
1.2 Software projects versus other engineering projects
1.3 Software projects activities
1.4 Software projects management control
1.5 Software projects requirement specification
1.6 Software projects issues
1.7 Capability Maturity Model (CMM)

UNIT 2: Software Project Planning
2.1 Overview of software project planning
2.2 Software project selection
2.3 Identify software project scope and project infrastructure,
2.4 Analyze software project characteristics and efforts required
2.5 Software project activity risks

UNIT 3: Software Project Management
3.1 Software project management activities: proposal writing
3.2 Software project planning and scheduling
3.3 Software project costing, monitoring and reviews etc.
3.4 Software project management: project plan, milestones and deliverables
3.5 Software Project scheduling: Program Evaluation and Review Technique, GANTT chart
3.6 Risk management: Risk Identification and Risk Management

PART-B

UNIT 4: Selection of Appropriate Project Approach
4.1 Criteria of choice for process models
4.2 Waterfall, V-process, Spiral model, Prototyping, Incremental

4.3 Software effort estimation: Basis for estimates
4.4 Albrecht function point analysis
4.5 COCOMO cost estimation model
4.6 Procedural code-oriented approach

UNIT 5: Software Project Evaluation

5.1 Software project strategic assessment
5.2 Software project technical assessment
5.3 Software Quality Audits
5.4 Software Quality Assurance
5.5 Software project cost benefit analysis
5.6 Software project evaluation techniques

UNIT 6: Software Projects Future Trends

6.1 Future of software project management
6.2 Project profile of current software
6.3 Next generation software economics
6.4 Modern process transitions
6.5 Issues in Android Software Development

Suggested Readings:

1. Roger S. Pressman, 2008, Software Engineering: A practical Approach, McGraw-Hill
2. Nageswara Rao Pusuluri, 2006, Software Testing Concepts and Tools, DreamTech
3. Pankaj Jalote, 2014, Software Project Management in Practice, Pearson
4. Sanjay Mohapatra, 2011, Software Project Management, Cengage Learning

Note: Only latest editions of the books are recommended.

Web links:

http://www.opensourcetesting.org/
http://www.onestoptesting.com/

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-602.1	3		3				3					3	3	2
MCA-DS-602.2	3	3	3				2		3			3	3	3
MCA-DS-602.3	2	2	2				2	2		3			3	3
MCA-DS-602.4			1			3	2	2		3			3	3
MCA-DS-602.5					3		3						3	3
MCA-DS-602.6		3	3		3		2	3	3			3	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-651: ADVANCE JAVA LAB

Periods/week Credits
P: 4 T: 0 2
Duration of Examination: 3 Hrs

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

Co-Requisite: Basic of Core java
Course Type: Core

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

MCA-DS-651.1Create basic data-driven programs using Java database connectivity.
MCA-DS-651.2 Create functional web pages using Servlets / JSP
MCA-DS-651.3 Apply JSP Customs tags and use them in JSP pages
MCA-DS-651.4 Create Multi-Tier web application using EJB Architecture.
MCA-DS-651.5 Develop a fully functional Web Application to solve a particular business problem.

List of Experiments:

1. Write a program to perform following functions: 1. Connect 2. Create Database 3. Create Table 4. Insert Records into respective table 5. Select records of particular table of database 6. Delete Records from table.
2. Write the code to insert three records into student table using PreparedStatement (assume student table with user id and user name).
3. Write a JAVA servlet program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a servlet).
4. Write a JAVA Servlet program to implement and demonstrate get() and post() methods (using HTTP Servlet class)
5. Write a JAVA servlet program using cookies to remember user preferences.
6. Write a program to perform state management using HttpSession using servlet.
7. Write a program to set the cookie information using servlet.
8. Write a program to maintain session for user using jsp.
9. Write a program for hotel booking using jsp.
10. Write a program to use different java operator using expression language function in jsp.
11. Write a hibernate example to insert a record of students into database.
12. Develop a small web program using Servlets, JSPs with Database connectivity.
13. An EJB application that demonstrates Session Bean
14. An EJB application that demonstrates Entity Bean.
15. An EJB application that demonstrates MDB.
16. Create Web Service client which consume above service and display student data by entering student id.
17. Implement Authentication filter using filter API
18. Create Servlet file and study web descriptor file
19. Study and implement Hibernate
20. Write RMI application where client supplies two numbers and server response by summing it. Provide your custom security policy for this application
21. Implement any one sorting algorithm using TCP/UDP on Server application and Give Input On Client side and client should sorted output from server and display sorted on input side.
22. Implement TCP Server for transferring files using Socket and Server Socket

23. Make a mini project based on above mentioned list of practical. Suggested mini projects are:

    a) New Patient Registry Management System
    b) Port Scanner Project in Java
    c) Distance Calculator using Google API
    d) IP address Changer Projects in Java
    e) Medical Store Billing Management System

Suggested Readings:

1. Patrick Naughton and Herbert Schildt, 2000, Complete Reference Java, Latest Edition, Tata
2. Hans Bergstan, 2003, Java Server Pages
3. Murach, 2005, Murach's beginning JAVA JDK 5, SPD
4. Knuckles, 2005, Web Applications Technologies Concepts- John Wiley
5. Pekowsky, 2004, Java Server Pages, Pearson

Note: Only latest editions of the books are recommended.

Software required/Web links:

Java SDK or JRE 1.6 or higher
Java Servlet Container (Free Servlet Container available)
http://www.oracle.com/technetwork/java/javase/downloads/jdk8-downloads-2133151.html

Distribution of Continuous Evaluation Table:

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

Assessment Tools:

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-651.1	3	3	2	2	2		1				2		2	2
MCA-DS-651.2	3	3	2	2	2		1	1			2		2	2
MCA-DS-651.3	3	3	2	2	2		1	1			2		2	2
MCA-DS-651.4	2	2		2			1				1		2	2
MCA-DS-651.5	2	2	2	3	2	1	2				1		2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-603: DATA MINING AND WAREHOUSING

Periods/week Credits	Max. Marks : 200
L: 2 T: 0 2	Continuous Evaluation: 100
Duration of Examination: 3 Hrs	End Semester Examination: 100

Pre-requisite: Knowledge of Data Base Management System

Course Type: Core

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

MCA-DS-603.1. Define the fundamental concepts of Data Warehouse.
MCA-DS-603.2.Describe the difference between data base management system, data mining and data warehouse.
MCA-DS-603.3.Demonstrate the architecture of a Data Warehouse
MCA-DS-603.4 Apply data mining techniques on different kinds of data.
MCA-DS-603.5. Compare various data mining techniques and their applications.

PART-A

Unit 1: Introduction to Data Warehousing

1.1 Evolution of data warehousing
1.2 Difference between data warehousing and data warehouse
1.3 Data Warehousing characteristics
1.4 Benefits of data warehousing
1.5 Comparison of OLTP and OLAP
1.6 Problems of data warehousing

Unit 2: Data Model

2.1 Data Mart
2.2 Data Cube
2.3 Multidimensional Data Model
2.4 Characteristics of OLAP System
2.5 OLAP operations on MDDM
2.5 Schemas for data model: Star, Snowflake and Fact constellation
2.6 Conversion of schemas using DMQL

Unit 3: Data Warehousing Architecture

3.1 Data Warehouse components
3.2 Three-Tier Data Warehouse architecture
3.3 Types of OLAP Servers
3.4 ROLAP versus MOLAP versus HOLAP
3.5 Distributed and Virtual data warehouse

PART-B

Unit 4: Introduction to Data Mining

4.1 Basic concepts of data mining
4.2 Data mining steps, data mining functionalities
4.3 Architectures of data mining

4.4 Knowledge Discovery in Data mining versus data mining
4.5 Applications of data mining
4.6 Classification of Data Mining Systems
4.7 Data Mining primitives
4.8 Data preprocessing
4.9 Integration of Data Mining System with a Data Warehouse

Unit 5: Data Mining Techniques
5.1 Support and confidence
5.2 Frequent Item set Mining methods
5.3 Multi-Level Association Rules
5.4 Multi-Dimensional Association Rules : Apriori algorithm
5.5 Correlation analysis

Unit 6: Classification and Cluster Analysis
6.1 Difference between Classification and Prediction
6.2Decision Tree Induction
6.3Bayesian Classification
6.4Prediction techniques
6.5Cluster Analysis
6.6Categorization of Clustering Methods
6.7Partitioning Methods
6.8Hierarchical Methods
6.9Data Mining Applications

Suggested Readings:

1. Jawei Han & Micheline Kamber, 2006, Data Mining- Concepts & Techniques, Morgan Kaufmann
2. Berry Michael, Linoff Gordon, 2008, Mastering Data Mining, John Wiley & Sons
3. Pudi Vikram, 2009, Data Mining, Oxford University Press
4. Thareja Reema, 2009, Data Warehousing, Oxford University Press

Note: Only latest editions of the books are recommended.

Softwares required:
Weka
Tanagra

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-603.1	1	1	1	1	1								1	1
MCA-DS-603.2	1	1	1	1	1								1	1
MCA-DS-603.3	1	1	1	1	1								1	1
MCA-DS-603.4	2	1	1	1	1								1	1
MCA-DS-603.5	2	2	2	2	2		2						2	2

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

MCA-EC-501: AZURE SECURITY ENGINEER ASSOCIATE

Periods/week Credits	Max. Marks: 200
L: 2 T: 2	Continuous Evaluation: 100
Duration of Examination: 3 Hrs	End Semester Examination:100

Pre-Requisite: Azure fundamentals
Course Type: Domain Specific

Course Outcomes: At the end of the course, the student will be able to:
MCA-EC-501.1. Configure and administer Azure Active Directory Instance.
MCA-EC-501.2. Deploy and configure Azure AD Connect to create a hybrid identity solution.
MCA-EC-501.3. Protect identities in Azure AD using Conditional access, access reviews, and other capabilities.
MCA-EC-501.4. Protect privileged identities.
MCA-EC-501.5. Use RBAC and Azure Policy.

PART-A

UNIT 1: Secure Azure Solutions with Azure Active Directory
1.1 Introduction
1.2 Explore Azure Active Directory features
1.3 Compare Azure AD vs Active Directory Domain Services
1.4 Investigate roles in Azure AD
1.5 Deploy Azure AD Domain Services
1.6 Manage users with Azure AD groups
1.7 Configure Azure AD administrative units

UNIT 2: Implement Hybrid Identity
2.1 Introduction
2.2 Deploy Azure AD connect
2.3 Explore authentication options
2.4 Configure Password Hash Synchronization (PHS)
2.5 Implement Pass-through Authentication (PTA)
2.6 Deploy Federation with Azure AD
2.7 Explore the authentication decision tree
2.8 Configure password writeback

UNIT 3: Deploy Azure AD identity protection
3.1 Introduction
3.2 Explore Azure AD identity protection
3.3 Configure risk event detections
3.4 Implement user risk policy
3.5 Implement Sign-in risk policy

PART-B

UNIT 4: Authentication in Azure
4.1 Deploy multifactor authentication in Azure
4.2 Explore multifactor authentication settings

4.3 Enable multifactor authentication
4.4 Implement Azure AD conditional access
4.5 Configure conditional access conditions
4.6 Implement access reviews

UNIT 5: Configure Azure AD privileged identity management
5.1 Introduction
5.2 Explore the zero trust model
5.3 Review the evolution of identity management
5.4 Deploy Azure AD privileged identity management
5.5 Configure privileged identity management onboarding
5.6 Explore privileged identity management configuration settings
5.7 Implement a privileged identity management workflow

UNIT 6: **Design an enterprise governance strategy**
6.1 Introduction
6.2 Review the shared responsibility model
6.2 Explore the Azure cloud security advantages
6.3 Configure Azure policies
6.4 Enable Azure role-based access control (RBAC)
6.7 Compare and contrast Azure RBAC vs Azure policies
6.8 Configure built-in roles
6.9 Enable resource locks
6.10 Deploy Azure blueprints
6.11 Design an Azure subscription management plan

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

Distribution of Continuous Evaluation Table:

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

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

COURSE ARTICULATION MATRIX:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-EC-501.1	3	1		2			2						3	3
MCA-EC-501.2	2	3	3	1			2						2	2
MCA-EC-501.3	2	2	2	1			2						2	3
MCA-EC-501.4	2	2	1	3	2		1						3	2
MCA-EC-501.5	3	2	1	2	2		2						2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-652: PROJECT

Periods/week Credits
P: 12 T: 0 6
Duration of Examination: 2 Hrs

Max. Marks : 500
Continuous Evaluation: 300
End Semester Examination: 200

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

1. Describe the Systems Development Life Cycle (SDLC).
2. Construct and evaluate data flow diagrams.
3. Design and evaluate system outputs
4. Construct and evaluate entity-relationship (ER) diagrams for real projects
5. Determine the various test cases and analyze the results.
6. Develop soft-skills including writing formal reports and delivering oral presentations.

Note: Project guidelines are enclosed in Annexure-A

The evaluation of the industrial training shall be made as per following:

Continuous Evaluation during training:

1. Evaluation by the Supervisor in the Industry	:	115 marks
2. Synopsis, High Level Design and Low Level Design	:	75 marks
3. Internal Seminar cum Presentation	:	110 marks
Total Internal Marks	:	**300**

External Evaluation after training:

1. Project Report	:	60 marks
2. Seminar cum Presentation	:	40 marks
3. Viva	:	100 marks
Total External marks	**:**	**200**

Annexure-A:

1. Guidelines for submission of Project

All the candidates of MCA Final year are required to submit a project report based on the work done by him/her during the project period based on any programming language. Presentation / viva will be based on the project work carried during the semester. The Project topics should be based on syllabus or beyond.

The project is evaluated on the basis of following heads:

1. Presentation
2. Viva
3. Project report
4. Software Coding
5. Documentation
6. Testing

2. Project Report Preparation Guidelines

Project report should consist the following:

I. Cover page as per the format (Annexure 1)

II. Declaration by the Student (Annexure 2)

III. Certificate from Department (Annexure 3)

IV. Acknowledgement

V. Index (Table of Contents in tabular form)

VI. Introduction

(a) About Organization

(b) Aims & Objectives

(c) Manpower

VII. System Study

a) Existing System along with limitations

b) Proposed System along with advantages

VIII. Feasibility Study

a) Technical
b) Behavioural
c) Economic

IX. Project Monitoring System

a) Gantt Chart

X. System Analysis

a) Requirement Specification
b) System Flowcharts
c) DFDs /ERDs (up to Level 2)

XI. System Design

a) File/ Data Design

XII. Input / Output Form Design

a) Screen Design (Screenshots of all screens In Color)
b) Report Design

XIII. System Testing

a) Preparation of Test Data
b) Testing With Live Data
c) Test Cases with results

XIV. System Implementation

a) System Requirements (Hardware/Software)

XV. Documentation

XVI. Scope of the Project

XVII. Bibliography

3. Project Report Submission Guidelines

a) Make 2 copies of the project.

b) Submit one original hard and one original soft copy of the project report to concerned guide.

c) A photocopy of the complete Project should be retained by the student for future reference.

d) Cover page should be properly formatted. (See Annexure 1)

e) The project report must be about 80-100 pages.

f) Source code or pseudo code should not be included in the project report

g) Student will be giving a presentation of about 5-10 minutes, highlighting the project objective, summary and report and findings of the project at the time of viva.

h) Project completed in all aspects with necessary enclosures should be submitted to the concerned Guide in specified time period.

i) The dimension of the project report should be in A4 size.

j) The project report should be bound using flexible cover of the thick plastic paper (Spiral Binding).

k) Report should use Font Arial/ Times New Roman; Font Size: 14 (For Headings Bold) and 12 (For Paragraphs). Document can have maximum of 1.5 lines spacing.

l) Project completed in all aspects with necessary enclosures should be submitted to the concerned Guide.

m) Violation of the project guidelines will lead to the rejection of the project at any stage.

n) A photocopy of the project report is not acceptable for submission.

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-653.1		3	3		3			2	2		2	2	2	3
MCA-DS-653.2	1	3						3			3			3
MCA-DS-653.3		2	3	1				2			2	2		1
MCA-DS-653.4	1	2			2		1	3			2	2		2
MCA-DS-653.5	2	2	2	2	2			3			3		1	3
MCA-DS-653.6						3	3		3			2		1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

MCA-DS-653: MAJOR PROJECT

Periods/week	Credits		
20-22 weeks	18	Max. Marks	: 900
		Internal	: 600
		External	: 300

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

7. Describe the Systems Development Life Cycle (SDLC).
8. Construct and evaluate data flow diagrams.
9. Design and evaluate system outputs
10. Construct and evaluate entity-relationship (ER) diagrams for real projects
11. Determine the various test cases and analyze the results.
12. Develop soft-skills including writing formal reports and delivering oral presentations.

Objective:

The objective of the MCA project work is to develop quality software solution. The student will get opportunity to work on live projects in IT Industry which help the students to enhance their technical skills. Six months training provides comprehensive learning platform to students where they can enhance their employ ability skills and become job ready along with real corporate exposure.

The evaluation of the industrial training shall be made as per following:

Continuous Evaluation during training:

1. Evaluation by the Supervisor in the Industry	:	200 marks
2. Evaluation by Faculty visiting industry during training	:	150 marks
3. Internal Seminar cum Presentation	:	250 marks
Total Internal Marks	:	**600**

External Evaluation after training:

1. Project Report	:	90 marks
2. Seminar cum Presentation	:	60 marks
3. Viva	:	150 marks
Total External marks	**:**	**300**

The parameters for evaluation by Supervisor during the training shall be as under:

	Marks
a) Work/Project undertaken	40
b) Punctuality	10
c) Regularity	10

d) Discipline	10
e) Overall Conduct	30
f) Willingness to Work	10
g) Innovation	20
h) Resourcefulness in acquiring technical knowledge	40
i) Relations with Seniors and others	10
j) Overall Proficiency achieved during training	10
k) Any contribution to the organization	10

	Total 200

The parameters for evaluation by the faculty visiting the industry during training shall be as under:

	Marks
a) Maintenance of Training Diary and Regularity	30
b) Relations with Seniors and others	30
c) Overall Conduct	30
d) Willingness to Work	30
e) Proficiency achieved	30

	150

COURSE ARTICULATION MATRIX

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
MCA-DS-653.1		3	3		3			2	2		2	2	2	3
MCA-DS-653.2	1	3						3			3			3
MCA-DS-653.3		2	3	1				2			2	2		1
MCA-DS-653.4	1	2			2		1	3			2	2		2
MCA-DS-653.5	2	2	2	2	2			3			3		1	3
MCA-DS-653.6						3	3		3			2		1

- ***Project guidelines are enclosed in Annexure I***

MASTER OF COMPUTER APPLICATIONS

(MCA)

PROJECT GUIDELINES
w.e.f
(2018)

Faculty of Computer Applications

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

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

Sector 43, Faridabad

Guidelines for submission of MCA Major Project

All the candidates of MCA final project are required to submit a project report based on the work done by him/her during the project period.

Project Time

The MCA Major Projects would be approximately 20-22 weeks and carries a total of 900 marks (300 Internals & 600 Externals). The Project topics should be based on syllabus or beyond.

Note:

If the company/organization in which the student has done his project is not allowing the student to submit the code to the University then the company/organization has to send a confidential report, clearly indicating the percentage of marks obtained by the student for his software project. To proceed with the project work, it is important to select a right topic and right organization, where you will get required information for the successful completion of the project work.

If on the basis of viva if the examiner feels that the project work has not actually being done by the student then he/she can allot zero marks for software coding.

1. Synopsis Preparation Guidelines:

Synopsis should be submitted within a week's time, after finalization of the topic. Synopsis, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following (not necessarily in order as given below).

a) Name / Title of the Project Statement about the Problem
b) Why is the particular topic chosen?
c) Objective and scope of the project
d) Methodology (including a summary of the project)
e) Hardware & Software to be used
f) Testing Technologies used.
g) What contribution would the project make?
h) Details of both internal and external guides.

I. Topic of the Project

This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

II. **Objective and Scope**

This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has been mentioned.

III. **Process Description**

The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFD's / Flowcharts to explain the flow of the information.

IV. **Resources and Limitations**

The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware / software or the data from the industry. The limitations of the proposed system in respect of a larger and comprehensive system must be given.

V. **Conclusion**

The write-up must end with the concluding remarks-briefly describing innovations in the approach for implementing the project, main achievements and also any other important feature that makes the system stands out from the rest.

Communication of Approval of Synopsis

After allocation of the project from the organization and go-ahead from the internal guide students should send the synopsis and 1-2 page write up of the organization to the Internal Guide or TPO in soft/hard copy. Incomplete Synopsis in any respect will be straightway rejected. An E-Mail regarding the approval / non approval of the project synopsis will be sent to the candidate within weeks of the receipt of the synopsis. In case of non-approval, the suggestions for reformulating the project will be communicated. Revised Project Synopsis Performa should be resubmitted along with a copy of the earlier synopsis and comments of the guide.

Page Specification:

Left Margin	3.0 cms
Right Margin	3.0 cms
Top Margin	2.7 cms
Bottom Margin	2.7 cms

Page numbers - All text pages as well as program source code listing should be numbered at the bottom centre of the pages.

Fonts:

Headings	Times New Roman	14	Bold
Sub Headings	Times New Roman	12	Bold
Paragraph Text	Times New Roman	12	Normal

Document Format:

The document should be sent in doc format.

2. Schedule:

- Submission of Proof of Training -- TBA
- Submission of complete synopsis -- TBA
- Review of Design Document (High Level) -- TBA
- Review of Design Document (Low Level) -- TBA
- Review of Project Report (Soft Copy) -- TBA
- Project Report submission (Soft Binding) -- TBA
- Final Project Assessment & Viva(Internal) -- TBA
- Final Report Submission & Viva(External) -- TBA

3. Project Report Preparation Guidelines:

Project report should consist the following:

I. Cover page as per the format
II. Declaration by the Student (Annexure 3)
III. Certificate from Department (Annexure 2)
   - Extreme Left (Candidate's Sign.)
   - Extreme Right (Project Supervisor)
   - Right Bottom: Head of Department.
IV. Certificate from Organization (Annexure 2)
V. Acknowledgement
   - Properly signed (right side)
   - Date on Left
VI. Index (Table of Contents in tabular form)
VII. Introduction
   - About Organization

- Aims & Objectives
- Manpower

VIII. System Study

- Existing System along with limitations/ deficiencies
- Proposed System along with intended objectives

IX. Feasibility Study

- Technical
- Economic, etc.

X. Project Monitoring System

- Gantt Chart

XI. System Analysis

- Requirement Specification
- System Flowcharts
- DFDs/HIPOs/ERDs (up to Level 2)

XII. System Design

- File/ Data Design

XIII. Data Dictionary

This should give a catalogue of the data elements used in the system / sub system developed. The following are the details required. Write NA if NOT applicable:

a. Data Name
b. Aliases if any
c. Length (size)
d. Type, Numeric, Alpha, Binary etc.
e. Program Specifications

XIV. Input / Output Form Design

- Screen Design (Screenshots of all screens In Color)
- Report Design

XV. System Testing

- Preparation of Test Data
- Testing With Live Data
- Test Cases with results (Minimum 100 test cases of different modules)

XVI. System Implementation

- Installation Instructions
- System Requirements (Hardware/Software)

XVII. Documentation

- User Manual
- Miscellaneous

XVIII. Scope of the Project

- Deficiencies
- Further Scope

Project Report Submission Guidelines:

1. Make 2 copies of the project.
2. Submit two original hard and original soft copy of the project report before exam.
3. Bring one original hard and original soft copy of the project for the exam, on exam date for viva and presentation.
4. Cover page should be properly formatted. (See Annexure 1)
5. You can make a third copy for your own record.
6. The full content of the report must be hard bound together so that the pages cannot be removed or replaced.
7. The project report must be about 100-150 pages
8. One of the copies should contain all the original certificates related to the training.
9. Other copy should have colored copies of the certificates.
10. Rest of the contents should be same.
11. Screenshots of all the forms should be printed in color.
12. Project report should contain at least 100 test cases of different modules.
13. Source code or pseudo code should not be included in the project report
14. The diagrams attached (DFD's and Flow charts) should be neat clean and clearly visible.
15. Student will be giving a presentation of about 5 Mins, highlighting the project objective, summary and report and findings of the project.
16. Text pages should be printed on one side of the paper, preferably with 1.5 spacing, and page numbers at the bottom of the each page. Margins should be 2" on the left and 1" on the right.
17. The project work must be undertaken in a company and it should be original in nature.
18. The project work should be designed in such a way that, it would be useful to the organization.
19. Do submit your project in specified time period.
20. Fonts:

Headings	Times New Roman	14	Bold
Sub Headings	Times New Roman	12	Bold
Paragraph Text	Times New Roman	12	Normal

Annexure 1

Title of the Project

(Organization: For Whom Developed)

Submitted to:

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES,

Faridabad (Haryana)

In Partial Fulfillment of

Master of Computer Applications (MCA)

Session: 2012-2015

Under the Supervision of:
(Name of Project Guide, Designation)

By:
Name: ( )
Roll No:
( )

Faculty of Computer Applications

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

Sector-43, Aravalli Hills
Faridabad – 121001, Haryana

Annexure 2

Certificate from the Guide

This is to certify that the project report entitled "_____" submitted in partial fulfillment of the degree of MASTER OF COMPUTER APPLICATIONS (MCA) to MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES , Faridabad is an authentic and original work carried out by Mr. / Ms._____ with Roll no. _____under my guidance.

The matter embodied in this project is genuine work done by the student and has not been submitted whether to this University or to any other University / Institute for the fulfillment of the requirements of any course of study.

Signature of the Student:
Date:
Name and Address
of the student

Signature of the Guide
Date:
Name, Designation
and Address of the
Guide:

(HOD)

Annexure 3

Declaration

I do hereby declare that this project work entitled "_____" submitted by me for the partial fulfillment of the requirement for the award of MASTER OF COMPUTER APPLICATIONS (MCA) is a record of my own work. The report embodies the finding based on my study and observation and has not been submitted earlier for the award of any degree or diploma to any Institute or University.

Date:

Name:

Roll No:

Appendix-A

List of courses having relevance to the Local/Regional, National and Global Development needs.

Course Code	Course Name	Regional	National	Global
MCA-RIC-I	Research Innovation Catalyst-I			√
MCA-DS-301	Linear Algebra and Statistical Techniques			√
MCA-DS-302	Data Structures		√	
MCA-DS-303	Object Oriented Programming in Java			√
MCA-DS-352	Data Structures Lab			√
MCA-DS-353	Object Oriented Programming in Java Lab			√
MCA-DS-357	Python Programming Lab			√
MCA-DS-304	Computer Graphics		√	
MCA-DS-305	Web Applications Development using PHP			√
MCA-DS-306	Multimedia and Animation			√
MCA-DS-355	Web Applications Development using PHP Lab			√
MCA-DS-354	Computer Graphics Lab		√	
MCA-DS-356	Multimedia and Animation Lab			√
MCA-RIC-II	Research Innovation Catalyst-II			√
MCA-DS-402	Data Communications		√	
MCA-DS-403	Analysis & Design of Algorithm		√	
MCA-DS-404	Artificial Intelligence			√
MCA-DS-451	Android Application Development Lab			√
MCA-DS-452	R Programming Lab			√
MCA-DS-453	Vocational Training		√	
MCA-DS-405	Cyber Security			√

MCA-DS-406	Mobile Computing			√
MCA-DS-407	System Programming			√
MCA-ID-001	Employability Skills Enhancement		√	
MCA-ED-401	Azure Data Fundamentals			√
MCA-EA-401	Azure AI Fundamentals			√
MCA-EC-401	Azure Fundamentals			√
MCA-RIC-III	Research Innovation Catalyst-III			√
MCA-DS-502	Advance Database Systems			√
MCA-DS-503	Programming in .NET			√
MCA-DS-504	Software Engineering & Testing			√
MCA-DS-552	Advance Database Systems Lab			√
MCA-DS-553	. NET Lab			√
MCA-DS-505	Big Data Analytics			√
MCA-DS-506	Cloud Computing			√
MCA-DS-507	Network Security and Cryptography			√
MCA-DS-508	Database Administration			√
MCA-DS-509	E-Commerce Technologies			√
MCA-ED-501	Azure Database Administrator Associate			√
MCA-EA-501	Azure Developer Associate			√
MCA-EC-501	Security operations Analyst Associate			√
MCA-DS-601	Advance Java			√
MCA-DS-602	Software Project Management		√	
MCA-DS-603	Data Mining & Warehousing			√
MCA-DS-651	Advance Java Lab			√
MCA-DS-652	Project		√	√

MCA-DS-653	Major Project		√	√
MCA-ED-601	Azure Data Engineer Associate			√
MCA-EA-601	Azure AI Engineer Associate			√
MCA-EC-601	Azure Security Engineer Associate			√

Appendix B: List of courses having focus on Employability, Entrepreneurship and Skill Development

Course Code	Course Name	Employability	Entrepreneurship	Skill development
MCA-DS-352	Data Structures Lab	√		√
MCA-DS-353	Object oriented programming in Java Lab	√		√
MCA-DS-357	Python Programming Lab	√		√
MCA-DS-355	Web Applications Development using PHP Lab	√		√
MCA-DS-451	Android Application Development Lab	√		√
MCA-DS-452	R Programming Lab	√		√
MCA-ID-001	Employability Skills Enhancement	√		
MCA-DS-553	. NET Lab	√		√
MCA-DS-651	Advance Java Lab	√		√
MCA-DS-653	Major Project	√	√	√
MCA-DS-652	Project	√	√	√

Appendix C: List of courses and proposed activities relevant to Professional Ethics, Gender, Human Values, Environment and Sustainability

	Environment and Sustainability	**Professional Ethics**	**Human Values**	**Gender Equality**
Activity on Gender Sensitization				√
Workshop on Ethical Hacking		√		