Bharati Vidyapeeth

(Deemed To Be University), Pune

(India)

***Accredited 'A+' Grade (2017) By NAAC ***
***'Category -I' University Status by UGC ***
*** 'A' Grade University Status by MHRD Govt. of India ***
*** Ranked '63rd' by NIRF-2020 under University Category ***

Faculty of Management Studies

Board of Studies in Computer Applications and System Studies

Master of Computer Applications Programme (MCA)

(2022 Course)

(Under Choice Based Credit System)

To be implemented from 2022-23

Content

Bharati Vidyapeeth (Deemed To Be University), Pune India
Faculty of Management Studies (Board of Studies in Computer Applications and System Studies)
Master of Computer Applications Programme (2022 Course)
(Under Choice Based Credit System)
To be effective from 2022-23 at Part I

I. INTRODUCTION:

The MCA Program is a full time 108 credits programme offered by Bharati Vidyapeeth (Deemed to be University), Pune and is conducted in regular and distance mode at its Management Institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. This programme is also conducted in onlne mode at CDOE under BV(DU). All the five institutes have excellent faculties, laboratories, library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in "Social Transformation through Dynamic Education."

II. VISION STATEMENT OF MCA PROGRAMME

Achieve excellence in Computer Applications with respect to teaching, learning and research to meet the growing needs of the industry and society.

III. MISSION STATEMENT OF MCA PROGRAMME

- Promote outcome-based learning strategies in-order to meet global industry standards.
- Encourage innovations and problem-solving capabilities in students and faculty.
- Cultivate collaborative research in both, students and faculty members through industry interactions and collaborations.
- Enhance entrepreneurship skills among students.

IV. PROGRAMME UNIQUE FEATURES

Keeping the view of National Education Policy, MCA Programme is designed with following features

- MCA is 2 year masters programme with 114 credits.
- The structure of programme is common for all learning modes - Regular, Distance, Online
- Provision to acquire interdisciplinary knowledge through MOOCs covering total 12 credits.
- Interdisciplinary General Courses covering Human Ethical Values, Life Skills, Swachh Bharat, Environmental Studies to make students aware about environment concerns and human values.
- Students can choose any of the elective group through which he/she will be trained in specialized area for better career.
- Internship project provides a platform which gives acquaintance for solving IT problems.

V. PROGRAMME OBJECTIVES

1: To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.

2: To provide a conducive environment for designing, implementing and testing various software applications through Software Development.

3: To keep the students and faculty abreast with the emerging technologies in the field of computer applications.

4: To bring professionalism amongst the students and promote holistic development.

5: To involve students in sustainable IT practices and community services.

VI. PROGRAMME OUTCOMES (PO)

PO1: Computational Knowledge: Apply knowledge of computing fundamentals, mathematics and given domain to design appropriate models for a given problem and/or requirements.

PO2: Problem Analysis: Apply fundamental knowledge of software engineering and various systems domain in order to analyze, identify, formulate and provide the solution to given problem.

PO3: Design/Development of Solutions: Design and evaluate solutions, systems, modules and processes for specified set of needs with appropriate consideration of societal values and industry expectations.

PO4: Conduct research in Computing problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Use of modern tools for delivering milestones like problem analysis, design, development, testing and deployment.

PO6: Professional Ethics: Learn and inculcate professional ethics, cyber regulations, professional responsibilities and norms of professional computing world.

PO7: Lifelong Learning: Acknowledge the need for continuous professional development and practice it through self-motivated, independent learning.

PO8: Management Domain: Involving in projects development as individual or group to solve problems in various domains and environments using computational and management skills.

PO9: Communication Efficacy: Demonstrate efficacy in verbal and non-verbal means of communication like reports, design documentation and presentations to elaborate about complex computing.

PO10: Innovation and Entrepreneurship: Provide conducive environment for innovation and entrepreneurship leading to solutions for betterment of society.

VII. PROGRAMME SPECIFIC OUTCOMES

PSO1: Ability to learn the various programming languages with database concepts and development environment

PSO2 : Ability to apply theoretical and practical knowledge to solve business problems in effective software solution through data communication technology concepts.

PSO3 : Enrich the knowledge in the areas of Advanced technologies and business practices.

PSO4 : Foster analytical and critical thinking abilities for efficient programming

PSO5 : Flourish the innovation and research attitude to develop IT artefact.

PSO6 : Maintain the personality with environmental and social concerns

VIII. ELIGIBILITY FOR ADMISSION:

Admission to the programme is open to any Graduate (10+2+3) of any recognized University satisfying the following conditions.

1. Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree. OR Passed B.Sc./ B.Com./ B.A. with additional bridge Courses (Bridge Course I/ Bridge Course II)as per the norms of the University.

OR

Passed any graduation degree (e.g. BE/ BTech/ BSc/BCom/BA/B.Voc/ etc) preferably with mathematics at 10+2 level or at Graduation Level

2. The candidate should have secured at least 50% marks (45% for SC/ST) in aggregate at graduate level university examination.
3. For students having No Mathematics background compulsory bridge course framed by the Bharati Vidyapeeth (Deemed to be University) related to Basic Mathematical knowledge should be completed.
4. For students having No IT background compulsory bridge course framed by the Bharati Vidyapeeth (Deemed to be University) related to computer subjects should be completed.

5. The candidate studying in final year of Bachelor's degree may also apply. Admission of such candidates will remain provisional until submission of final result certificates in original.
6. Subject to the above conditions, the final admission of final admission is based solely on –

a. The merit at All India Entrance Test conducted by Bharati Vidyapeeth (Deemed to be University), Pune.
b. Submission of Migration Certificate, Transfer Certificate, anti-ragging affidavit etc.

IX. DURATION OF THE PROGRAMME

The duration of this programme is two years divided into four semesters or a minimum of 114 credits whichever is later. The medium of instruction and examination will be only English.

X. MOOC Policy :

The Bharati Vidyapeeth (Deemed to be University), Pune offering MOOCS stands for Massive Open Online Courses Subjects. The student will complete MOOC courses prescribed by Institute from following sources in respective semester and will be evaluated based on the scores obtained by the Student/Learner in MOOCs.

Following are the sources from where Students/Learners can undertake MOOCs

1. iimb.ac.in
2. swayam.gov.in
3. alison.com
4. edx.org
5. nptel.com (technical courses)
6. Coursera
7. harvardx.harvard.edu
8. udemy.com
9. futurelearn.com
10. Indira Gandhi National Open University (IGNOU)
11. National Council of Educational Research and Training (NCERT)

12. National Institute of Open Schooling (NIOS)
13. National Programme on Technology Enhanced Learning (NPTEL)

Important Note:

- Students can complete MOOCs anytime during 02 years from the time being admitted to Programme
- Students have to submit completion Certificate of MOOCs. Unless certificate of all 03 MOOCs submitted, Fourth Semester Marksheet will not be issued.

XI. SCHEME OF EXAMINATION:

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

XII. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the student/learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If Student fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he has to reappear only at IA as backlog candidate and clear the Head of Passing. to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks≤80	A+	9
60≤Marks≤70	A	8
55≤Marks≤60	B+	7
50≤Marks≤55	B	6
40≤Marks≤50	C	5
Marks < 40	D	0

Table I : Grade Points and Grades

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course.The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40.The total marks out of 100are converted to grade point, which will be the GPA.

Rules of ATKT

For course upto four semesters, a student is allowed to carry any number of Backlogs of a prescribed course in Sem-I, II, III to Sem-IV provided he appears and have backlogs

A student can appear for any four continuous semesters in an examination season including the regular semester, provided the student has appeared and have backlogs for other three semesters.

Formula to calculate Grade Points (GP)

Suppose that “Max” is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set x = Max/10 (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
8x ≤ Marks≤10x	10
5.5x ≤ Marks≤8x	Truncate (M/x) +2
4x ≤ Marks≤5.5x	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and theCumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum Ck * GPk}{\sum Ck}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\Sigma C_k * GP_k}{\Sigma C_k}$$

where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the studyfrom the time of his/her enrollment and also during the semester for which CGPA is calculated. The CGPA shall be calculated up to two decimal place accuracy.

The formula to compute equivalent percentage marks for specified CGPA:

% marks (CGPA)	10 * CGPA-10	If 5.00 ≤ CGPA ≤ 6.00
	5 * CGPA+20	If 6.00 ≤ CGPA ≤ 8.00
	10 * CGPA-20	If 8.00 ≤ CGPA ≤ 9.00
	20 * CGPA-110	If 9.00 ≤ CGPA ≤ 9.50
	40 * CGPA-300	If 9.50 ≤ CGPA ≤ 10.00

XIII. Award of Honors :

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.5≤CGPA ≤10	O	Outstanding	80≤Marks≤100
9.0≤CGPA ≤9.49	A+	Excellent	70≤Marks≤80
8.0≤CGPA ≤8.99	A	Very Good	60≤Marks≤70
7.0≤CGPA ≤7.99	B+	Good	55≤Marks≤60
6.0≤CGPA ≤6.99	B	Average	50≤Marks≤55
5.0≤CGPA ≤5.99	C	Satisfactory	40≤Marks≤50
CGPA below 5.0	F	Fail	Marks below 40

Important Note:

- Student or Learner is expected to write Two Research Papers and publish it in Peer Reviewed Journals.
- A Student /Lerner can carry any number of backlog paper till Semester-IV provided his/her academic term(s) is/are granted

XIV.Question Paper Patterns for University Examination

The pattern of question paper for the courses having University Examinations (**Regular mode**) will be as follows:

Title of the Course

Day: **Total Marks: 60**

Date: **Time: 03 Hours**

Instructions:

1. Section I **Question No 1** is **Compulsory** based on MCQ. Each question carries 01 marks
2. Attempt any **FIVE** questions from Section II. Each question carries 08 Marks.
3. Attempt any **ONE** from Section III. Each question carries 10 marks

SECTION – I			
		CO (CO number to be mentioned: Refer Syllabus)	BL (Bloom's Taxonomy Level to be mentioned viz. Create (1); Evaluate (2); Analyze (3); Apply (4); Understand(5); Remember (6)
Q 1. Includes 10 objective type sub questions covering all units of course, each sub question carries 1 mark. (Each question should be mapped with the CO & BL)	(10 marks)	Each objective questions to be mapped with CO & BL	
SECTION – II			
It should contain 6 questions covering the syllabus. Questions should be set uniformly from all the units.		CO (CO number to be mentioned: Refer Syllabus)	BL
Question	Marks	CO	BL
Q.2 ……	(8 marks)		
Q.3 ……	(8 marks)		
Q.4 ……	(8 marks)		
Q.5……	(8 marks)		
Q.6……	(8 marks)		
Q.7 Write Short Notes on ANY TWO a.	(8 marks)		

b. c.			
SECTION – III			
This section should be based on case-study, problem solving and would carry 10 marks. Questions in this section should be designed to evaluate the higher levels of Bloom's Taxonomy viz. Create, Evaluate, Analyze, Apply.		CO	BL
Q.8……..	(10 marks)		
Q.9……	(10 marks)		

Note:

1. Answer book for the Section I will be separate and student should return this answer book within first half an hour.
2. Answers to Section II and III should be written in the SAME ANSWER BOOK.
3. The question paper should be relevant to the set of course outcome.
4. Question Papers shall be prepared to incorporate varying levels of difficulty such as:
    i. Must know – Vital (60% weightage)
    ii. Should know – Essential (20% weightage)
    iii. Could know – Desirable (20% weightage)
5. The length of the question-reasonably feasible for an average student to answer with in the stipulated time.

The pattern of question paper for the courses having University Examinations (**Distance mode**) will be as follows:

Title of the Course

Day: **Total Marks: 70**

Date: **Time: 03 Hours**

Instructions:

1. Section I **Question No 1** is **Compulsory**. Each question carries 01 marks.
2. Attempt any **FIVE** questions from Section II. Each question carries 08 Marks.
3. Attempt any **TWO** from Section III. Each question carries 10 marks.

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SECTION – I			
		CO (CO number to be mentioned: Refer Syllabus)	BL (Bloom's Taxonomy Level to be mentioned viz. Create (1); Evaluate (2); Analyze (3); Apply (4); Understand(5); Remember (6)
Q 1. Includes 10 objective type sub questions covering all units of course, each sub question carries 1 mark. (Each question should be mapped with the CO & BL)	(10 marks)	Each objective questions to be mapped with CO & BL	
SECTION – II			
It should contain 6 questions covering the syllabus. Questions should be set uniformly from all the units.		CO (CO number to be mentioned: Refer Syllabus)	BL
Question	Marks	CO	BL
Q.2 ……	(8 marks)		
Q.3 ……	(8 marks)		
Q.4 ……	(8 marks)		
Q.5……	(8 marks)		
Q.6……	(8 marks)		
Q.7 Write Short Notes on ANY TWO a. b. c.	(8 marks)		
SECTION – III			
This section should be based on case-study, problem solving and would carry 10 marks. Questions in this section should		CO	BL

be designed to evaluate the higher levels of Bloom's Taxonomy viz. Create, Evaluate, Analyze, Apply.			
Q.8……..	(10 marks)		
Q.9……	(10 marks)		
Q.10……	(10 marks)		

Note:

6. Answer book for the Section I will be separate and student should return this answer book within first half an hour.
7. Answers to Section II and III should be written in the SAME ANSWER BOOK.
8. The question paper should be relevant to the set of course outcome.
9. Question Papers shall be prepared to incorporate varying levels of difficulty such as:
    iv. Must know – Vital (60% weightage)
    v. Should know – Essential (20% weightage)
    vi. Could know – Desirable (20% weightage)

The length of the question-reasonably feasible for an average student to answer with in the stipulated time.

XV.SEMESTER WISE COURSE STRCTURE

	Semester I	**Credits**	**Hours/Week**			**IA Marks**	**UE Marks**
			L	T	P		
101	Applied Database Management Systems	4	3	1	-	40	60
102	Computer Networks	4	3	1	-	40	60
103	Java Programming	4	3	1	-	40	60
104	Computational Statistics	4	3	1	-	40	60
105	Management Concepts and Applications	4	3	1	-	40	60
106	Lab on Applied Database Management Systems	3	1	0	4	40	60
107	Lab on Java Programming	3	0	0	6	40	60
108	MOOCS-I *	4	Online	-	-	50	00
109	Open Course-I **	2	2			50	00
		32	**18**	**05**	**10**	**380**	**420**

*Student has to complete MOOCS compulsory [Please refer MOOCS guidelines as per pointno. X]

**** Student can select any one of the following courses as Open Course - I in consultation with HOD/Coordinator**

Sr. No.	**(109) Open course – I**
1	**Universal Human Values (UHV)**
2	**Cyber Security**
3	**Soft Skills**

	Semester II	Credits	Hours/Week			IA Marks	UE Marks
			L	T	P		
201	Object Oriented Software Engineering	4	3	1	-	40	60
202	Cloud Computing Concepts	4	3	1	-	40	60
203	Data structures using Python	4	3	1	-	40	60
204	Data Warehousing and Data Mining	4	3	1	-	40	60
205	Web Supporting Technologies	4	2	1	4	40	60
206	Lab on Data Structures using Python	3	0	0	6	40	60
207	Minor Project – 1	3	3	-	-	00	100
208	MOOCS-II *	4 4	Online	-	-	50	00
209	Open Course-II**	2	2			50	
		32	**19**	**05**	**10**	**340**	**460**

*Student has to complete MOOCS II compulsory [Please refer MOOCS guidelines as per pointno. X]

**** Student can select any one of the following courses as Open Course- II in consultation with HOD/Coordinator**

Sr. No.	(209) Open course – II
1	**Foreign Language**
2	**Digital Technology**
3	**Human Psychology at Workplace**

	Semester III	Credits	Hours/Week			IA Marks	UE Marks
			L	T	P		
301	Software Design Patterns	4	3	1	-	40	60
302	Artificial Intelligence	4	3	1	-	40	60
303	Information Security	4	3	1	-	40	60
304	EL-GRP-1 (A)	3	2	1	-	100	-
305	EL-GRP-2 (A)	3	2	1	-	100	-
306	Lab on Software Testing	3	1	0	4	40	60
307	Minor Project – 2	3	3	-	-	00	100
308	MOOCS-III *	4	Online	-	-	50	00
309	Open Course-III **	2	2	-	-	50	00
		30	**19**	**05**	**04**	**460**	**340**

*Student has to complete MOOCS II compulsory [Please refer MOOCS guidelines as per pointno. X]

**** Student can select any one of the following courses as Open Course- III in consultation with HOD/Coordinator**

Sr. No.	(309) Open course – III
1	**Social Change in Technology**
2	**Water Management**
3	**Economics for IT Industry**

	Semester IV	Credits	Hours/Week			IA Marks	UE Marks
			L	T	P		
401	Seminar on Recent Trends in IT[#]	4	-	-	-		100
402	El-GRP - 1 (B)	3	2	1	-	100	-
403	El-GRP –2 (B)	3	2	1	-	100	-
404	Major Internship Project	10	-	-	-	-	100
		20	**07**	**07**	**-**	**200**	**200**

Practical Examinations:

For courses 106, 107, 205, 206 and 306 University Practical Examination will be held and marks will be reported to the University.

Project Guidelines:

Minor Project I (207) and Minor Project II(307)

Students are expected to choose a problem which will provide software solutions. The project should be based on the courses student students studied in the previous semester. The projects can be completed as individual project or if the scope of the project is comprehensive then project can be divided into modules by the project guide and a group of students can work on it. The number of students in the group can be decided by project guide and it should not be less than 2 and more than 4. Every student or group must have meeting about progress of project with their project guide regularly as specified in time table or if required at a communicated by guide.

The project dissertation/document is expected to be created and it should have the following contents.

a. SRS – Problem Statement, BRD- Business Requirement Document
b. General Requirement
c. Requirement as per user Role
d. System design (RED/Class Diagrams, DFD/Activity diagrams)
e. User screen design and client side validation
f. Database Design
g. User interface design /user manual
h. Test cases
i. Scope and limitation
j. Conclusion
k. Bibliography

Major Internship Project (404)

The student is expected to get exposure of industry through 'Major Internship Project'. Guidelines about project are as bellow.

1. Student must undergo 60 Days Industrial Internship.
2. Every project will be evaluated by University appointed panel at the end of the semester.
3. Student must report about the progress of project to the internal project guide regularly as specified in time table or if required at a time given by guide.

Seminar on Recent Trends in IT: (401)

Student will select any topic of interest and study it thoroughly throughout the semester. At the end of the semester, student will give a presentation on the topic before the panel appointed by the University and submit the seminar report.

XVI. List of Elective Groups:

Elective Code	Elective Group	Subject Code	Subjects
01	Cloud Computing	A	Virtualization
		B	AWS
02	Data Science	A	Statistical Programming in R
		B	Introduction to Data Science
03	Linux	A	Linux Desktop Environment, Shell Programming and System Administration
		B	Linux Internals and Network Administration
04	Open Source Technologies	A	Perl Scripting
		B	Ruby
05	Mobile Computing	A	Java Script
		B	Android
06	Dot Net Technologies	A	C# Programming and Applications
		B	ASP Dot Net with MVC

07	Net Centric Technologies	A	HTML 5
		B	AJAX Programming
08	Information Systems	A	Recommender System
		B	Knowledge Management
09	IOT	A	IoT Architecture Sensors and Fundamentals with Hands-on lab
		B	Internet Of Things: Sensing And Actuator Devices and Smart city use case
10	Big Data	A	Introduction to Big Data
		B	Business Intelligence Tools With Hadoop
11	Cyber Security	A	Introduction to Information Security
		B	Information Security Threats and Mitigation Strategies
12	Data Management	A	Data Management Environment
		B	Industrial Data Management and Security

XVII. Bridge Course I:

This course is designed and compulsory for the students from Non-IT background. The course can be conducted concurrently with semester I courses. The evaluation of this course will be at institute level for 100 marks. The student must score minimum 40 marks to pass this course. There will be no credits assigned to this Bridge Course.

Subject Name	Bridge Course I
No. of Credits	00
Pre Requisite	Basic Mathematics and MSCIT course
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Basic formula for finding areas, volumes, graphical representation of data is to be remembered.
Understanding	Do calculations by using formulas, algorithm, C program structure are to be understood
Applying	Apply basic knowledge of mathematics and computers to write programming codes.
Analyzing	Analyze the problem to represent in proper format such as graphs, trees for effective working
Evaluating	Evaluate the programs or problems for algorithms, logic
Creating	Creating proper program logic so as to reduce lines of codes is expected
Unit	**Content**
1.	Algorithm ,flow charts, integers, division, relations, relations and their types, representation of relation in computer memory, number conversion systems
2.	Trees, applications of trees, tree traversal algorithms, minimum spanning trees
3.	Fundamentals of C programming, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.
4.	Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement, Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-while loop, for loop, Nested for loop, Jump statements-break, continue, goto statements

5.	Function call, return statement, Function parameters, Types of functions, Arrays and functions
6.	Introduction to OOP concepts.
Text Books	1.Discrete Structures by Kenneth Rosen 2.C programming by Yashwant Kanetkar 4.Object Oriented Programming by Balguruswamy
Reference Books	C Programming language by Brain W. Kernighan

Bridge Course II :

This course is designed and compulsory for the students from Non-Mathematics background and who have not completed mathematics in their 12^{th} or graduation course. The course can be conducted concurrently with semester I courses. The evaluation of this course will be at institute level for 100 marks. The student must score minimum 40 marks to pass this course. There will be no credits assigned to this Bridge Course.

Subject Name	Bridge Course II
No. of Credits	00
Course Objective	To prepare background of the student to study courses in MCA
Cognitive Abilities	**Course Outcome as per Blooms Taxonomy**
Remembering	Remembering basic concepts and their representations
Understanding	Understanding applications of various discrete structures like sets, relations, graphs etc.
Applying	Applying various structures to represent problem data.
Analyzing	Learn to analyze the data for the given problem for representing it using proper structure.
Evaluating	Evaluate the problem for proper discrete structures.
Creating	Design new structures based on basic discrete structures to represent data..
Text Books	Discrete Structures by Kenneth Rosen
Course Plan	
Unit	**Content**
1.	**Set Theory :** Definition of a set, Representation of elements of sets, Methods of representing sets , types of sets, operations on sets , cardinality of a set, Principle of Inclusion and Exclusion , Venn Diagram , Proof by using Venn diagram
2.	**Functions and Relations :** Definition of Function, Types of Functions ,Composite Function, Relation definition, representation of relations
3.	**Logic:** Propositions, Logic Operations-Negation, Disjunction, Conjunction, Conditional and Biconditional, Truth Tables of compound propositions, Translating English sentences in to logical statements and vice versa, Logic gates and circuits

4.	**Matrices:** Matrix Definition, General Form, Representation of matrix in computers, Types of matrices, Operations on matrices: Addition, Subtraction and Multiplication, transpose , row / column transformations , Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices
5.	**Graphs -** Graph terminologies, types of graphs , representation of graph in computers, Paths, Eular and Hamilton graphs, graph colorings.

Dr. Pallavi Jamsandekar
Chairperson
Board of Studies
Computer Applications and system studies

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**CourseCode**	**CourseTitle**	
I	**101**	**Applied Database Management Systems**	
	Prepared By	**Prof. Smita Gambhire**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	UE:IE	60:40

Course Objectives:

- To teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases.
- To impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.

Course Outcomes:

CO1: Remember the database concepts
CO2: Understand the concept of database and techniques for its management
CO3: Understand data security standards and methods.
CO4: Understand the fundamentals of Distributed Database Systems
CO5: Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model.
CO6: Normalize the database.
CO7: Identify and study the file organization schemes for DBMS.
CO8: State and Describe features for Concurrency and Recovery.
CO9: Convert the relational algebra statements to the SQL statements
CO10: Design the queries using Relational Algebra

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to DBMS** Difference between Data, Information, Data Processing & Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data	**5**	**CO1,CO2**	Lecture with Ppts, Discussion	Understand	Discussion

	Independence. Database users, Types of Database System. Database Languages, DBMS interfaces .					
2	**Data Modeling in Database** Data Models, Logical Data Modeling : Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak Entity Set.The extended entity relationship (EER) model, Subclass, Superclass, generalization, specialization, Attribute Inheritance. Relational Data Model : Codd's Rules for RDBMS, Translating ER Diagram toRelational Database.	**7**	**CO5**	Lecture with Ppts, Practical sessions on computer	Understa nd the Models and analyze	Unders tand and draw the models of databas e
3	**Normalization and Relational Algebra** Normalization Vs De-Normalization, Decomposition, Lossy and Lossless Decomposition,FunctionalDep endencies,Normal forms 1NF, 2NF, 3NF, BCNF, Case Studies on Normalization. **Relational Algebra:** Keys: Composite, Candidate, Primary, Secondary, Foreign,Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product,Joins: Outer Joins,	**7**	**CO6,CO 9,CO10**	Lecture with PPTs, Case Studies	Understa nd and analyze	Analyz e and practic e the case studies on various

	Inner Joins with example.					
4	**File Structures and Data Administration** File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing	**6**	**CO7**	Lectures with PPTs,	Evaluate	Formulate and practice the case studies on various topics
5	**Concurrency Control And Recovery Techniques** **Concurrency Control:** Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation **Recovery Techniques:** Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points,	**7**	**CO8**	Lectures with PPTs,	Compose and execute	Discussion

	Shadow Paging.					
6	**Data Administration And Security** Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management. Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement	**7**	**CO3**	Lectures with PPTs	Demonstrate	Discussion
7	**Introduction to Distributed Database, NOSQL and MongoDB** Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed DatabaseArchitecture. Levels of distribution, transparency, replication. Fragmentation. • Introduction to NoSQL – Architecture, Sharding , Replica sets • NoSQL Assumptions and the CAP Theorem • Strengths and weaknesses of NoSQL • MongoDB Functionality Examples	**6**	**CO4**	Lectures with PPTs, Write NoSQL and Mongodb Documents	Compose and execute	Understand and calculate cost of project

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	PublisherCompany
1	RamezElmasri, Shamkant B. Navathe	Fundamentals of Database Systems	Global Edition
2	ASilberschatz, H Korth, S Sudarshan	Database System and Concepts	McGraw-Hill.
3	Shakuntala Gupta Edward	Practical MongoDB	Navin Sabharwal published by APress

Online Resources:

Online Resources No	Web site address
1	https://www.w3schools.com/sql/
2	https://www.tutorialspoint.com/sql/index.htm
3	https://www.javatpoint.com/sql-tutorial

MOOCs:

Online Resources No	Web site address
1	https://www.coursera.org/learn/intro-sql
2	https://www.coursera.org/projects/introduction-to-relational-database- and-sql
3	https://www.coursera.org/projects/intermediate-rdb-sql

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**CourseCode**	**Course Title**	
I	**102**	**Computer Network**	
	Prepared By	**Mr. Prasanna R. Rasal**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	UE:IE	60:40

CourseObjectives:

To make students to:

- To teach the fundamentals of the computer network systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of networking.
- To impart knowledge of the concepts related to networking and implementation of computer network. It also gives the idea how computer network is managed in various environments with emphasis on computer hardware and network terminology measures as implemented in organizations.

Course Outcomes:

After completing the course the students shall be able to

CO1: Using some basic concepts of Computer Hardware and Network terminology for development of basic networks in the organization.

CO2: By remembering students the basic concepts students will understand the concepts of Network topology, network operating systems and how the networks are developed as per the need of the organization.

CO3: Students will have thorough knowledge about Computer Network and its use for the Information Sharing, device sharing and use of various new network technologies. Students will acquire a good knowledge of the computer network, its architecture and operation. Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters).Students will be able to follow trends of computer networks. So, students will get exposer to advanced network technologies like MANET, WSN, and 4G.

CO4: Ability to select proper method to design the network systems, selecting the proper tool to design the network protects the network from misuse.

CO5: Apply the concepts of C# programming to create console based and windows based applications.

CO6: Design and create their own procedure to protect the computer network and use the sharing proper resources.

Unit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Computer Networks** Basic concepts of computer hardware and network terminology, What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, **Network software in brief:** Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, **Network Models:** The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, **Examples of some networks:** Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless LANs- (Wi-Fi)	**7**	CO1	Lecture with PPTs, Quiz	Remembering And Understanding	End Term Internals Assignments Quiz
2	**Data Transmission and Physical Layer:** **Signals:** Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum **Transmission Media& its Characteristics:** Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing**:** FDM, WDM, TDM, Switching**:** Circuit, Message and Packet Switching.	**7**	CO2	Lecture with PPTs	Understanding	End Term Internals Assignments Quiz
3	**Network Layer:** **Network Layer Design Issues;**	**8**	CO3	Lecture with PPTs	Evaluating and	End Term Internals

	Routing Algorithms: Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, **Congestion Control Algorithms:** General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, **IP Addressing:** IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask.				Applying	Assignments Quiz
4	**Transport and Application Support Protocols** Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, **Session Layer:** Token Concept **Presentation Layer:** Data Encryption and Data Security, Message Authentication	**7**	CO4	Lectures with PPTs	Analyzing and Creating	End Term Internals Assignments Quiz
5	**Advance Networks:** Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, **Mobile Ad-hoc Networks:** Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, **Wireless Sensor Networks:** Sensor networks overview: Introduction, applications, design issues, requirements.	**7**	CO4	Lecture With PPTs, Demonstration	Evaluating And Creating	End Term Internals Assignments Quiz
6	**Internet Basics** Concept and Characteristics of Internet, Intranet, Extranet. Structure of Internet through Client Sever. Domain name, Website Development formats for Business Applications. **Practical**	**7**	CO5	Lectures with PPTs	Applying And Analyzing	End Term Internals Assignments Quiz

	Application on: Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW, HTTP, TCP/IP, LAN, WAN Some basic Operations and commands.					
7	**Mobile Network** Mobile Telephone Systems: various generations mobile technology, Smart Mobile facilities and Apps on Mobile . Sub netting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6	**7**	CO5	Lecture With PPTs, Demonstration	Evaluating And Understanding	End Term Internals Assignments Quiz

Reference Books:

Sr.No.	Name of theAuthor	Titleof the Book	Publisher Company
1	Eugene Blanchard	Introduction to Networking and Data Communications	-
2	Douglas E. Comer.	Computer Networks and Internets with Internet Applications	Pearson Publication 4th edition
3	JyotiBiradar (Patil),Anil Gaikwad	"Software Project Management -Made Easy"	Lambert Academic Publishing House

OnlineResources:

OnlineResourcesNo.	Websiteaddress
1	https://www.studytonight.com/computer- networks
2	https://www.tutorialspoint.com/data_communication_computer_network/index.htm
3	https://www.w3schools.blog/computer-network
4	Computer Network in Brief : - http://www.nripesheschool.com
5	, http://www.freetechbooks.com/computer network

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL/Swayam

2	www.edx.com
3	www.coursera.com

Semester	CourseCode	CourseTitle	
I	103	Java Programming	
	Prepared By	Dr. Dhanashri Vinay Sahasrabuddhe	
Type	Credits	Evaluation	Marks
DSC	4	UE:IE	60:40

Course Objectives:

- Understanding basic constructs used in java program and using in problem solving after analyzing the problem.
- Understanding and implementing Object Oriented Programming concepts using java.
- Writing OOP programs for given problems.
- Representing problem data using proper java collection and utility classes.
- Understand different streams used in java for input and output.

Course Outcomes:

CO1: Write simple programs to use basic programming language constructs

CO2: Design interfaces, abstract and concrete classes needed, given a problem specification

CO3: Implement classes designed using object oriented programming language

CO4: Learn how to test, verify, and debug object-oriented programs and create programs using

CO5: Make them comfort to muse Java API for Input/output and Java Collections and utility classes also able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming

Unit No.	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Java** Java Basics: Features of Java, History of Java, Installations of JDK and eclipse as IDE Writing and executing first Java program. Understanding role Java compiler, JVM, Understanding how Java is platform independent and secure.	9	CO 1	Lecture with PPTs, Practicing programming problems	Understand, Apply, Analyze	Quiz, writing short answers

	Java data types, variables, operators, expressions, type conversion and casting in Java. Control structures in java: if, if-else and switch statements, using iterative/looping statements in Java: while, do-while and for. Writing functions: Need of functions/methods, Writing and using static method; concepts of passing values and returning					
2	**Class and Object Concepts:** Introduction to Object Oriented concepts, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Java naming conventions for class, properties and methods/functions. Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final Understanding use of Wrapper classes and Garbage collection in Java	7	CO2, CO3	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers
3	**Arrays and Strings** One dimensional arrays, Multidimensional arrays, exploring String class and methods, String Buffer class. Packages - creating and accessing a package, importing, packages, creating user defined packages, Concept of package. Introduction to Exception	6	CO1	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers

	Handling and user defined exceptions.					
4	**Inheritance and Polymorphism :** Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Overriding methods with throws clause. Using abstract and final keywords with class declaration, Concept of interface, Comparison of Interface and class. Access modifiers and data accessibility in derived classes, method access modifier and method overriding.	6	CO2, CO3	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers
5	**Concurrent Programming:** Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods .	7	CO1	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers
6	**Java Input/Output :** Concept of streams, types of streams – byte streams, character streams, The Console: System.out, System.in, and System.err Understanding File class, InputStream class, OutputStream class, FileInputStreams, FileOutputStream, Using character oriented Reader and Writer class, FileReader, FileWriter. Introduction to Buffered	7	CO5	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers

	streams – DataInput and DataOutput Streams using BufferedReader, BufferedWriter. Making use of Object Streams for Serialization and deserialization					
7	**Java Collections and Utility Classes:** Introductions to generics: generic types and methods Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, making use of Iterator to access collection elements. Set: HashSet, LinkedHashSet, TreeSet , Role of Comparable and Comparator interfaces, Introduction Map: Hashmap, HashTable, TreeMap, LinkedHashMap Understanding bounded types, erasures.	8	CO4	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, writing short answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1.	Herbert Schildt	Java: The Complete Reference	Seventh Edition, 2007	McGraw-Hill Osborne Media
2.	Cay S. Horstmann and Gary Cornell	Core Java-Volume-I	Eighth Edition, 2008	Sun Core Series
3.	Bruce Eckel	Thinking In Java	Fourth Edition	Printice Hall

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.geeksforgeeks.org/
2	https://www.tutorialspoint.com/
3	https://www.javatpoint.com/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
I	**104**	**Computational Statistics**	
	Prepared By	**Dr. Vishal Deshmukh**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	UE:IE	60:40

Course Outcome:

CO1: To build a strong foundation for students to become proficient in all Statistics concepts and theirApplicationnecessary to become aDatascience Professional.
CO2: To provide a conducive environment for understanding, implementing and Prediction on various Historical data.
CO3: To keep the students and faculty abreast with the emerging technologies in the field of computer applications.
CO4: To bring professionalism amongst the students and promote holistic development.

Unit No.	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Statistics** : Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Types of data: Primary data, Secondary data , Cross-sectional data, time series data, directional data, classification data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.	8	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Measures of Central Tendency** : Concept of central tendency of statistical data, Statistical averages, characteristics	8	CO 1	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied Questions

	of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion. Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation					
3	**Moments, Skewness and Kurtosis** : Concept of Raw and central moments, Formulae for ungrouped and grouped data (only first four moments), relation between central and raw moments upto fourth order. (without	8	CO 2	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions

	proof) , Measures of Skewness, Types of skewness, Pearson's and Bowley's coefficient of skewness, Measure of skewness based on moments, Measure of Kurtosis: Types of kurtosis, Measure of kurtosis based on moments					
4	**Correlation**: Bivariate data, Scatter diagram and interpretation., Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks	7	CO3	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions
5	**Regression** : Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.	7	CO3	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	**Time Series:** Meaning and utility , Components of time series , Additive and multiplicative models , Methods of estimating	7	CO4	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied

	trend : moving average method, least squares method and exponential smoothing method(with graph and interpretation)					
7	**Introduction to R Programming:** Concept of R, Installation of R, Data Types , Vector, List, Frame, Array, Matrix, Statistics Commands, Base graphics, Data manipulation with data table ,concept of cluster, Concept of Prediction Model ,Analysis of Real world Problem	7	CO4			

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1.	S.C.Gupta	Fundamental of Statistics		
2.	Freedman, David, Robert Pisani, & Roger Pervis(2007).	Statistics	..New York: W. W. Norton	
3.	James, Gareth, Daniela Witten, Trevor Hastie, & Robert Tibshirani(2013)	An Introduction to Statistical Learning: With Applicationsin R	New York: Springer.	

Online Resources

OnlineResourcesNo.	Websiteaddress
1	NPTEL / Swayam www. edx.com, www.coursera.com

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL
2	Swayam

Programme:MCACBCS– RevisedSyllabusw.e.f.-Year2022 –2023			
Semester	**Course Code**	**Course Title**	
I	**105**	**MANAGEMENT CONCEPTS AND APPLICATIONS**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
Inter Disciplinary Course	4	UE:IE	60:40

Course Objectives:

- To understand the basic Management Concepts and Skills.
- To study the Principles and Functions of Management.
- To learn the Applications of Principles of Management.
- To familiar with the Functional areas of management.
- To study the Leadership styles in the organization.
- To expose to the recent trends in management.

Course Outcomes:

After learning CO1: Students will be in a position to recall day to day management concepts that are unknowingly applied in real life situations

CO2: Students will learn implementation of management functions in real life cases so as to justify decision being taken and through ERPs availability

CO3: tudents will learn fact finding in a situation using the objectives of each functions' achievement and its effective utilisation in e commerce environment

CO4: Students will be able to generate or enhance the ability in fact finding techniques and evaluating the actual performance with the planned.

CO5: Students are expected to capture the new cases in real life situation and create a solution in the form of model so as to resolve the problem such as ERPs

Unit		Hrs	COs No	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Management** Definition and Meaning ,Nature and purpose ,Evolution of Management thoughts, Contributions of F.W Taylor ,Contributions of Henry Fayol, Human relations approach, System approach to management, Skills and Functions of a manager	07	CO1	Power Point Presentations, Classroom Sessions	Understand	End Term
2	**Planning** Definition and Importance ,Types of Plans, Types of Planning , Steps in Planning ,Limitations of Planning ,Planning Premises, Management by Objectives (MBO):Concept, Objective setting Process, Benefits and Weaknesses, concept of software project planning	06	CO2 CO3	Classroom Sessions	Understand	Case Study Discussion, Class Test' End Term Class Assignment
3	**Organization** Definition ,nature of organizing, importance , process of organizing ,organization chart ,structure of IT organization , New Organisational Designs – Project, Matrix, Organic Structure & Mechanistic Structure Challenge of Modern Organisation, Virtual Organisation,Case study	07	CO3	Classroom Sessions	Understand and apply	Case Study, Question and Answer, End Term

4	**Staffing** Nature & Significance, A brief knowledge of Recruitment, Selection, Training & Development, Performance Appraisal in IT organisation. Case study	06	CO4	Classroom Sessions	Learn and draw	Case Study, End Term
5	**Directing and Controlling** Nature, Concept of Leadership, Leadership Styles, Theories of Leadership, Charismatic Leadership Theory, Role of Software Team Leader, case study , Concept and Importance of Control, Control Process, Types of Control Mechanism, Responsibility and authority , Management by Exceptions, case study.	09	CO5	Classroom Sessions with case study	Learn and draw	End Term
6	**Decision making** Decision making and its process, Decision making conditions , need of computer based decision making , decision support system, expert system.	04	CO1, CO5	Power Point Presentations	Learn and draw	Case Study, End Term
7	**Introduction to E-commerce** E commerce types,E commerce spread in recent years ,E commerce importance ,Security measures under E commerce, introduction to Enterprise Resource Planning (ERP) ,ERP advantages, Introduction to SAP	06	CO6	Classroom Sessions	Apply the knowledge gained so far	Case Study, End Term

Reference Books:

Online Resources

Online Resources No.	Websiteaddress
1	http://www.ft.com/business-education.
2	http://www.makeinindia.com/policy/new-initiatives.
3	https://india.gov.in/
4	http://pmindia.gov.in/en/
5	http://www.makeinindia.com/policy/new-initiatives
6	https://mygov.in/group/digital-india
7	www.skilldevelopment.gov.in/World%20Youth%20Skills%20Day.html

MOOCs:

ResourcesNo.	Website address
1	https://www.coursera.org/learn/management-fundamentals-healthcare- administrators

Programme:MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
I	**106**	**Lab on Applied Database Management Systems**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

- To practice the application of the concepts related to database its techniques and Operations.
- SQL (Structured Query Language) is introduced in this subject. This helps to create strong foundation for application of database design.

Course Outcomes:

CO1: Make use of different operators as per the questions
CO2: Understand the theoretical and physical aspect of a relational database
CO3: Implementation of RDBMS concepts through Oracle
CO4: Observe the performance of the query with different data sets.
CO5: Test the results obtained from the different queries, PL/SQL blocks, functions
CO6: Construct Simple and complex queries on sample datasets
Writing PL/SQL blocks

Unit	Contents	Sessions (Hrs)	Cos Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Oracle and SQL (8 Lectures)** History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export. **Introduction to SQL** Keywords, Delimiters, Literals, Data Types, Components of SQL: **DDL Commands**– Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with	**8**	**CO2,CO3, CO6**	Lecture with Ppts, Discussion	Understand	Discussion

	constraints on row level and column level, primary key, foreign key, check. Altering Constraints. **DML Commands**- Inserting, updating, deleting data, **DQL Commands**: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. **DCL commands**- Granting and Revoking Permissions					
2	**Operators and Functions (5 Lectures)** **Operators**:Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data. **Functions :**Aggregate Functions, Numeric Functions, String Functions, Date Functions, Conversion Functions, MiscellaneousSub queries **Joins:**Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join	**5**	**CO1,CO 4**	Lecture with Ppts, Practical sessions on computer	Understa nd the Operator s	Practic al Assign ments And Practic e
3	**Database Objects (5 Lectures)** **Views:**Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View. **Sequences:**Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence. **Index:**Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.	**5**	**CO3,CO 6**	Lecture with PPTs, Case Studies	Understa nd and execute	Practic al Assign ments And Practic e

4	**Introduction To PL/SQL (5 Lectures)** Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype,Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint	**5**	**CO3,CO 5**	Lectures with PPTs,	Evaluate	Practical Assignments And Practice
5	**Cursor Management and Triggers (5 Lectures)** **Cursor**:Explicit& Implicit Cursor, Declaring Cursor Variables, Constrained & Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors. **Triggers:**Definition, Syntax,Parts of triggers:statement, body, restricted, Types of triggers: Enabling& disabling triggers.	**5**	**CO3,CO 5**	Lectures with PPTs,	Compose and execute	Practical Assignments And Practice
6	**Stored Procedures / Functions and Exception Handling (5 Lectures)** Introduction, How oracle executes procedures/ functions, Advantages, How to createProcedures& Functions, Examples. **Error Handling in PL/SQL:** Exception Handling & Oracle Engine, Oracles Named Exception Handlers, User NamedException Handlers.	**5**	**CO3,CO 5**	Lectures with PPTs	Demonstrate	Practical Assignments And Practice
7	**MongoDB (7 Lectures)** Installation of MongoDB, Checking Shell, Creating Users and Enabling Authorization, Basic Querying Using Shell, sorting, indexing – single indexing and compound indexing, Using Conditional Operators in queries	**7**	**CO3,CO 4**	Lectures with PPTs, Write NoSQL and Mongodb Documents	Compose and execute	Practical Assignments And Practice

Reference Books:

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Ivan Bayross	SQL,PL/SQLThe Programming Language of Oracle	3rd Revised Edition	BPB Publications
2	Shakuntala Gupta Edward	Practical MongoDB	--	NavinSabharwal by APress

Online Resources:

Online Resources No	Web site address
1	https://www.w3schools.com/sql/
2	https://www.tutorialspoint.com/sql/index.htm
3	https://www.javatpoint.com/sql-tutorial

MOOCs:

Online Resources No	Web site address
1	https://www.coursera.org/learn/intro-sql
2	NPTEL / Swayam www. edx.com
3	https://www.coursera.org/projects/introduction-to-relational-database-and-sql
4	https://www.coursera.org/projects/intermediate-rdb-sql

Programme:MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
I	**107**	**Lab on Java Programming**	
	Prepared By	**Dr. Dhanashri Vinay Sahasrauddhe**	
Type	**Credits**	**Evaluation**	**Marks**
???	3	UE:IE	60:40

Course Objectives:

- Understanding basic constructs used in java program and using in problem solving after analyzing the problem.
- Understanding and implementing Object Oriented Programming concepts using java.
- Writing OOP programs for given problems.
- Representing problem data using proper java collection and utility classes.
- Understand different streams used in java for input and output.

Course Outcomes:

CO1: Write simple programs to use basic programming language constructs

CO2: Design interfaces, abstract and concrete classes needed, given a problem specification

CO3: Implement classes designed using object oriented programming language

CO4: Learn how to test, verify, and debug object-oriented programs and create programs using

CO5: Make them comfort to muse Java API for Input/output and Java Collections and utility classes also able to achieve object persistence using object serialization and writ modules to take advantages of concurrent programming

Unit	**Contents**	**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Java** Writing, compiling and Executing Java programs using basic language constructs as bellow - Using Operators : arithmetic, relational, logical and bitwise - Control structures (if, if-else, switch) - Iterative statements (while, do-while, for)	8	CO 1	Lecture with PPTs, Practicing programming problems	Understand, Apply, Analyze	Quiz, testing programming skills through practical test.

2	**Class and Object Concepts** - Wring a class, creating objects and using it - Using constructors to initialize object - Programs to demonstrate parameter passing - Making use of access modifiers	8	CO2, CO3	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.
3	**Arrays and Strings** – Programs to work with single dimensional and multidimensional arrays – Searching and sorting – Programming with string and operations on it – Programs to understand and study string literal pool	8	CO1	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.
4	**Inheritance and Polymorphism** – Defining classes as generic types ; using it to write new class/classes – Need and example of method overriding – Writing abstract class and interface – Using abstract classes to write concrete classes – Using interface as base type to write new interface and implementing it to write new concrete class/classes – Anonymous and inner classes	8	CO2, CO3	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.
5	**Concurrent Programming** – Designing and using Thread class and Runnable interface – Thread synchronization – Program to demonstrate Thread priorities, thread join and making use of yield – Programs with classes making use of thread	8	CO1	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.

	and inter communication between them.					
6	**Java Input/Output** – Programs to make using InputStream and OutStream classes. – Reading and Writing data into files – Making use to console to read data. – Using readers and writers to write data into Files – Making use of Buffered Streams and reader and writer – Programs to take advantages of serialization	8	CO5	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.
7	**Java Collections and Utility Classes** – Programs to make use collections (ArrayList, Vector, Set and Maps) – Writing user defined generic data types types – Programs to illustrate bounded types and erasures		CO4	PPTs, Practicing programming problems	Understand, Analyze, Apply	Quiz, testing programming skills through practical test.

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
2.	Herbert Schildt	Java: The Complete Reference	Seventh Edition, 2007	McGraw-Hill Osborne Media
2.	Cay S. Horstmann and Gary Cornell	Core Java-Volume-I	Eighth Edition, 2008	Sun Core Series
3.	Bruce Eckel	Thinking In Java	Fourth Edition	Printice Hall

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.geeksforgeeks.org/
2	https://www.tutorialspoint.com/
3	https://www.javatpoint.com/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
I	**109**	**Universal Human Values**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
???	2	IE	50

Course Objectives:

- To help the student to see the need for developing a holistic perspective of life.
- To sensitize the student about the scope of life – individual, family, society and
- nature/existence.
- Strengthening self-reflection.
- To develop more confidence and commitment to understand, learn and act accordingly.

Course Outcomes:

CO1: To provide an overview of Prerequisites to Human Values
CO2: Understand the role of a human being in ensuring harmony in self and society
CO3: To actualize a harmonious environment wherever they work
CO4: To analysing ethical dilemma while discharging duties in professional life
CO5: To evaluate ethical and unethical decisions and take a right stand
CO6:To develop a harmonious environment for holistic development of self and body

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Value Education& Harmony in Human Being** 1. Value Education, Definition, Concept and Need for Value Education. Self exploration as a means of Value Education.		CO1, CO2	As per individual faculty discretion	Rememberi ng	As per individual faculty discretion
2	**Harmony in the Human Being** 1. Human Being is more than just the Body. 2. Harmony of the Self ('I') with the Body -		CO6	As per individual faculty discretion	Create	As per individual faculty discretion

	happiness and physical facility 3. Understanding Myself as Co-existence of the Self and the Body. 4. Understanding Needs of the Self and the needs of the Body. Understanding the activities in the Self and the activities in the Body					
3	**Harmony in the Family and Society and Harmony in the Nature** 1. Family as a basic unit of Human Interaction and Values in Relationships. 2. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude, Prosperity and Love. 3. Comprehensive Human Goal: The Five Dimensions of Human Endeavour. 4. Harmony in Nature: The Four Orders in Nature. 5. The Holistic Perception of Harmony in Existence.		CO3	As per individual faculty discretion	Applying	As per individual faculty discretion
4	**Professional Ethics** 1. Value based Life and Profession. 2. Professional Ethics and Right Understanding. 3. Competence in Professional Ethics. Issues in Professional Ethics – The Current Scenario.		CO4, CO5	As per individual faculty discretion	Analyse & Create	As per individual faculty discretion

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Bertrand Russell	Human Society in Ethics & Politics	2015	Taylor and Francis
2	I.C. Sharma	Ethical Philosophy of India	1965	Johnsen

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://fdp-si.aicte-india.org/verifiedProgramDetailsList.php
2	https://citizenchoice.in/course/Universal-Human-Values/Unit%201/Happiness-and-Prosperity

MOOCs:

ResourcesNo.	Websiteaddress
1	Swayam.gov.in
2	https://epgp.inflibnet.ac.in

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
I	**109**	**Cyber Security**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
????	2	IE	50

Course Objectives:

- To understand different types of threats.
- To know the ways of different cyber-attack being adopted .
- To recognize types of viruses such as malware, virus, hacking and cracking activities

Course Outcomes:

CO1:To understand techniques of encryption.

CO2: To understand the term Cryptography and its importance in computer forensics and cyber security

CO3: To identify Cyber Crime and the action thereof.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**CyberSecurity** Meaning of Cyber security ,meaning of Cyber Crimes, ways of achieving Cyber Security, IT Act, Computer Ethics and Security Policies, Guidelines to choose web browsers, Guidelines for setting up a Secure password, Online Banking Security, Mobile Banking Security ,Web Application Security, Digital Infrastructure Security		CO 3	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Information Security-** Threat to business continuity due to accidents related to information systems,		CO 2	Lecture with Ppts Case Study		Case Study , Newspaper Article

	Cyberspace, Information assets, Vulnerabilities ,Information security measures, Threats such as Unauthorized intrusion, Unauthorized access, Eaves dropping , Spoofing ,Alteration , Cracking.				Apply (Analyse)	End Term: Applied Questions
3	**Kinds of Cyber-attack** Information leakage, DoS attack, Rumor, Flaming, SPAM e-mail , Computer virus ,Macro virus, Worm, Bot (botnet, remote operated virus), Trojan horse, Spyware, Ransomware, Key logger, Root kit, Backdoor, Fake anti-virus software		CO 2	Lecture with PPTs Case Study	Apply (Analyse)	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Cryptography-** **Meaning of cryptography , e**ncryption , decryption ,Symmetric cryptography , Public key cryptography		CO1	Lectures with PPTs Group Activity Case Study	Apply (Analyse)	Group Activity End Term Exam: Short case and situation based questions

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	BhushanMayank ,	Fundamentals of Cyber Security by		BPB Publications
2	Jason Andress	Foundations of Information Security :A Straight forward Introduction		

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
I	**109**	**Soft Skills**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
???	2	IE	50

CourseObjectives:

- To familiarise students about the various soft skills
- To boost students' communication and presentation skills

CourseOutcomes:

CO1:Development of Critical and reflective thinking;

CO2:Self-management and self awareness skills amongst the students.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Soft Skills** Introduction ,the objectives of soft skills development , Integral Parts of Soft Skills ,Outcomes of Soft Skills Development ,Personal Developmental Plan (PDP), self awareness	3	CO1,CO2	Lectures, Videos, Practical of making PDP	Understand and Apply	Assignment &Class Exercises Evaluation

2	**Communication Skills** Definition, Nature and Scope of Communication ,Importance and Purpose of Communication, Process of Communication ,Types of Communication, Aspects of communication skills ,verbal and non verbal communication skills, Essentials of Effective Communication	3	CO1	Lectures, Videos	Understand	Assignment &Class Exercises Evaluation
3	**Presentation Skills** Objectives , Types of presentations, factors to be considered while preparing presentation , creating a Presentation, delivering a Presentation, attending a Presentation , body Language and etiquettes	3	CO1,CO2	Lectures, Videos, Practical of making Presentation	Create	PPT making and Presentation evaluation
4	**Time Management Skills** Need, objectives, time management techniques , benefits of time management , factors to be considered - delegation of task, prioritse work,creating schedule,set up deadline,Overcome Procrastination,dealing with stress, avoiding multitasking,start early etc.	3	CO1	Lectures, Videos, Practical of task time management	Understand and Apply	Class Exercises Evaluation

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Prashant Sharma	**Soft Skills 3rd Edition: Personality Development for Life Success**		BPB publications
2	Brian Tracy	**Time Management: The Brian Tracy Success Library**		

Programme: MCA CBCS– Revised Syllabus w.e.f.-Year 2022 –2023			
Semester	**Course Code**	**Course Title**	
II	**201**	OBJECT ORIENTED SOFTWARE ENGINEERING	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

Course Objectives:

- To familiarize students with the software concepts
- To learn software engineering procedure by using the concepts of object oriented programming concepts.
- To use modern techniques to evaluate software requirement.

Course Outcomes:

After learning

CO1: The students will learn various steps carried out in development of software.

CO2: The students shall be able to understand requirements from the user of the software.

CO3: The students be able to apply object-oriented concepts and UML diagrams to the defined problem.

CO4: The students will learn to analyze requirements of the user and convert to functionalities of the software.

CO5: The students will learn to analyze and design of the existing software and new software.

Unit	Contents	Sessions(Hrs)	COs No	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Software and Software Engineering** The nature of software, Software Engineering Concept, SDLC, Process Models: Waterfall Model, V Model, Prototyping Model, Spiral Model, RAD (Rapid Action Development) Model	05	CO1	Power Point Presentations, Classroom Sessions	Understand	End Term
2	**Object Oriented Concepts, Modeling and UML** What is Object Orientation? (Introduction to class, object, inheritance, polymorphism) Modeling Introduction of Modeling Object Oriented Modeling UML (Unified Modelling Language) History of UML	05	CO2,CO3	Classroom Sessions	Understand	Case Study Discussion, Class Test' End Term Class Assignment

	UML Diagrams Iterative Development with RUP and Phases of RUP					
3	**Requirement Understanding and Requirement Modelling with Use Case Diagram** Requirement Engineering, Requirement Elicitation Developing Use Cases Use Case Diagram Realization of Use Cases Finding Actors Defining Relations among Use case Writing Use Cases Activity Diagram	05	CO4	Classroom Sessions	Understand and apply	Case Study, Question and Answer, End Term
4	**Basic and Advanced Structural Modeling** Class Diagram, Identifying the elements of an object model ,Identifying classes and objects , Specifying the attributes , Defining operations,Finalizing the object definition , Advanced class Modelling , Interface, Types and Roles , State Chart Diagram, Package Diagram, Object Diagram	10	CO4	Classroom Sessions	Learn and draw	Case Study, End Term
5	**Interaction Modelling** Introduction to Interaction Diagrams, Need of Interaction Diagrams, Interaction Diagrams,Collaboration Diagram ,Sequence Diagram	08	CO4	Classroom Sessions with case study	Learn and draw	Class Test End Term
6	**Architectural Modeling** 6.1 Component Diagram 6.1.1 Need of Component Diagram 6.1.2 Realization of Components 6.1.3 Relating Components 6.2 Deployment Diagram 6.2.1 Software Architecture 6.2.2 Architectural Styles 6.2.3 Representing	07	CO5	Power Point Presentations	Learn and draw	End Term

	Architecture using Deployment Diagram					
7	**Case Studies** 7.1 Discussion on following case Studies- a. Library Management System b. Hospital Management System c. Online Shopping d. Nukari.com website e. Matrimonial website	05	CO5	Classroom Sessions	Apply the knowledge gained so far	End Term

Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1	Pressman	Software Engineering by	2002	Publisher BPB
2	Grady Booch, James Raumbaugh, Ivar Jacobson	The Unified Modeling Language User Guide	2018	Addison-Wesley Professional
3	Ivar Jacobson	Object Oriented Software Engineering Use case driven approach	2019	Publisher Pearson
4.	Hans-Erik Eriksson P	UML Toolkit 2	2018	Wiley

Online Resources:

OnlineResourcesNo.	Websiteaddress
1	https://codingee.com/introduction-to-object-oriented-software-engineering
2	https://artoftesting.com/object-oriented-design-in-software-engineering

MOOCs:

ResourcesNo.	Website Address
1	NPTEL

Programme:MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
II	**202**	**Cloud Computing Concepts**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

Course Objectives:

- Identify the technical foundation of cloud systems architectures.
- Analyze the problems and solutions to cloud applications problems.
- Apply principle of best practice in cloud application design and management.
- Identify anddefine technical challenges for cloudapplications and assess their importance.

Course Outcomes:

CO1: How to provide Flexible and scalable infrastructures.
CO2: Increased availability of high-performance applications to small/ medium-sized businesses.
CO3: Reduces implementation and maintenance costs.
CO4: The case studies will help us to understandmore of practice of cloud computing in the market.
CO5: Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization.
CO6: Creating flexible and scalable infrastructure suitable to the organizational need.

Unit	CONTENT	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Cloud Computing Fundamentals** Definition of Cloud Computing, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds	10	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Virtualization And Cloud Computing** Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud	07	CO 2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyze)	Quiz End Term Internals: Short Answers
3	**Service Oriented Architecture And The Cloud** Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing.	07	CO 3	Lecture with PPTs Case Study	Analyze	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Cloud Applications** Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.	07	CO4	Lectures with PPTs Group Activity Video Cases	Evaluate	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
5	**Management Of Cloud Services** Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)	07	CO2	Lecture/ Practical Case Activity	Apply	Case Presentation Activity End Term: Theory Applied
6	**Application Development** Service creation environments to develop cloud based applications.	07	CO6	Lectures with PPTs Flip	Create	Activity, Presentation End Term:

	Development environments for service development; Amazon, Azure, Google App.			Classroom		Theory Applied
7	**Cloud It Model** Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)	07	CO5	Group Activity	Evaluate	Activity, Presentation Group discussion EndTerm :Theory Applied

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	RajkumarBuyya, JamesBroberg and Andrzej MGoscinski.	Cloud Computing: Principles and Paradigms	2010	WileyPublication
2	Kai Hwang, GeofferyCFox, Jack J. Dongarra	Distributed & Cloud Computing	2012	Morgan Kaufmann
3	John W. Rittinghouse,James F. Ransome.	Cloud Computing implementation,management and security	2009	CRCPress,Taylor & Francis group
4	Anthony T.Velte,TobyJ.Velte Robert Elsenpeter.	Cloud Computing a practical approach	2009	Tata Mc Graaw Hill edition.
5	George Reese	Cloud Application Architecture	2009	O Reilly publishers
6	DavidS.Linthicum,	Cloud computing and SOA convergence in your enterprise	2009	Addison- Wesley

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.geeksforgeeks.org
2	http://www.thinkitsolutions.com
3	http://Cloudcomputingarchitecturetutorial/youtube.com

MOOCs:

ResourcesNo.	Websiteaddress
1	http://onlinecourse.nptel.ac.in
2	swayam.gov.in

Programme: MCA CBCS–Revised Syllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
II	**203**	**Data Structures and Algorithms using Python**	
	Prepared By	**Dr.Suvarna Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

Course Objectives:

- To Implement Object Oriented Programming concepts in Python. .
- To Understand Lists, Dictionaries and Regular expressions in Python.
- To Understand how searching and sorting is performed in Python.
- To Understand how linear and non-linear data structures works

Course Outcomes:

CO1: Understand Python syntax and semantics and apply Python flow control and functions, libraries.
CO2: Understand Python Programs using core data structures like Lists
CO3: Understand and apply Linked list, Tree, Searching, Sorting
CO4: Apply the concepts of Object-Oriented Programming for Python

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Basics of Python** Python Installation, writing and executing first python script, using python editors to write and execute python scripts **Identifiers and Operators:** Writing get familiar with python variables and data types, variables and assignments, Operator understanding and its usage, **Python Control structures in Python:** Conditionals and Loops: if statement, else Statement, el-if Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, Arrays Working strings in python: String type, strings concatenations and comparing strings, using string functions	8	CO 1	Lecture with Ppts	Understand	Short Answers
2	**Working with functions and Built in data structures Functions** Writing a simple function and using it, functions and parameters, functions retuning values, functions and variable scope, Variable number of arguments,	8	CO 1	Lecture with Ppts	Understand	Short Answers

	passing objects and collections in function, understanding recursive functions, writing and using recursive functions. Variable number of arguments to functions **Python data Structures:** List: Crating and using list and tuples. Operations on list and tuples, Special Features of Lists and tuples, introduction to List comprehensions Dictionaries: Introduction to Dictionaries, Operators, Built-in Functions, Built-in Methods, Dictionary Keys, Using Set data structure					
3	**Handling Exceptions and File Input/Output** Need of exception Handling, Simple mechanism to handle exception, Using if exceptions to handle the code cracks, Using else clause while handling exceptions, Handling generic and specific exceptions, handling multiple exceptions, Raising exception, File Objects, creating a file object, reading File contents, Writing data into file, reading and writing CSV files, usingwith clause, Using Exception handling with file operations	8	CO2	Lecture with Ppts	Understand	Short Answers
4	**Introduction ADT** Writing a simple Class in Python, creating object of class, Instance Methods, Class Variables and special methods. Understanding ADT, Defining ADT using pseudo-code, Defining ADT for Date, Stack and Queue, Implementation of Date, Stack and Queue ADT. Concepts of circular and double ended queue. Applications of Stack and Queue	8	CO1	Lecture with Ppts	Understand	Short Answers
5	**Linked Lists** Defining List as ADT, Implementation of Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, The Positional List ADT, Sorting a Positional List, Link-Based vs Array-Based Sequences. Implementation of Stack and Queue using Link List. Applications of Linked List (polynomial Equations)	8	CO2	Lecture with Ppts	Understand	Short Answers
6	**Trees** Concepts of tress and Binary Trees, Defining binary tree as ADT, Implementing Binary	8	CO4	Lecture with Ppts	Understand	Short Answers

	Trees, Tree Traversal Algorithms **Search Trees**: Binary Search Trees ,Balanced Search Trees ,Python Framework for Balancing Search Trees ,AVL Trees ,Splay Trees, Red-Black Trees **Heaps, Maps, Hash Tables, and Skip Lists**					
7	**Searching , Sorting and Analysis of Algorithms** Need of searching, linear search, using binary search for efficient search. Need of sorting and various sorting algorithms: insertion sort, bubble sort, selection sort; Merge sort and quick sort algorithms. Python's Built-In Sorting Functions, Selection Algorithms. Analysis of Algorithms: Measuring Algorithm Efficiency, Asymptotic Analysis, The Big-O Notation, Find the complexity of Algorithms: Linear Search, Binary Search, Sorting Algorithms. Compare complexity of various searching and sorting Algorithms	9	C04	Lecture with Ppts	Understand	Short Answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author)	Data Structures and Algorithms in Python Paperback	2016	WILEY PUBLICATION
2	NarasimhaKarumanchi	Data Structure and Algorithmic Thinking with Python Paperback	2015	
3	Hemant Jain	Problem Solving in Data Structures & Algorithms Using Python: Programming Interview		

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/python/index.htm
2	https://www.javatpoint.com/python-tutorial
3	https://www.w3schools.com/python/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL
2	UDEMY

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
II	**204**	**Data Warehousing and Data Mining**	
	Prepared By	**Dr. Sujata Mulik**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

Course Objectives:

- This course will enable to expose the students to Study various design and implementation issues and techniques in data warehousing and data mining.

Course Outcomes:

CO1: Remembering the fundamentals of Database technology and its application in data warehousing and data mining.
CO2: Creating multi-dimensional data models using star, snowflake and fact constellation schemas.
CO3;Understand the components, architecture and other important tools of data warehousing and data mining
CO4: Apply the techniques of clustering, classification, association and other data mining algorithms to real world data
CO5: Gather and analyze large sets of data to gain useful information using data mining techniques.
CO6: Producing and interpreting quantitative analysis using various data mining algorithms.

Unit	Contents	Sessions(Hrs	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Business Intelligence:** Business Environment and Computerized Decision Support, Managerial Decision Making, Computerized support for Decision Making Decision Support System, Early Framework for Computerized Decision SupportBusiness Intelligence, Importance of BI, BI for Decision makers, The BI process, A framework for Business Intelligence.	6	CO 1	Lecture with Ppts	Understand	Assignment Case Study
2	**Data warehousing:** OLTP and OLAP Systems, Introduction to Data Warehouse, Differences between OLTP Systems and Data Warehouse , Characteristics of Data Warehouse; Advantages of Data Warehouse; Data Warehouse Users, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema.	8	CO 2,CO3	Lecture with Ppts Case Study	Apply (Analyse)	Case Study , Examples discussion Mid Term: Applied Questions

	OLAP Operations, OLAP Models.					
3	**Data Preprocessing** Need, Objectives and Techniques of data preprocessing. **Descriptive Data Summarization**: Measuring the Central Tendency, Measuring the Dispersion of Data, Graphic Displays of Basic Descriptive Data Summaries **Data Cleaning:** Handling of Missing values and Noisy Data, Data cleaning as a process **Data Integration and Transformation:** Data Integration: Schema integration, Controlling redundancies using correlation. Data Transformation: Smoothing, Aggregation, Generalization, Attribute construction, Normalization **Data Reduction:** Data Cube Aggregation; Attribute Subset Selection, Dimensionality Reduction, Numerosity Reduction, Discretization & ConceptHierarchy Generation for Numerical Data and for Categorical Data.	10	CO1,CO4	Lecture with PPTs Demonstration on ML tool	Analyse	Case Study discussion Mid Term Exams: Case based Questions/ Applied Questions
4	**Introduction to Data Mining** Evolution of database system technology, introduction to data mining, architecture of a typical data mining system, Types of data that can be mined, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.	8	CO4	Lectures with PPTs	Analyze	Class Test Assignment End Term Exam: Short case and situation based questions
5	**Mining Association Rules** Introduction, Market Basket Analysis, Multi-Level and single level Mining, Mining Association Rules on Transactional database, Multi-Dimensional Association Rules From Relational Databases & Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining, Association Rule mining using Apriori Algorithm, and FP Growth algorithm. Generalized association rule.	10	CO5	Lectures with PPT ,Examples ,case study	Create	Research paper activity End Term: Theory Applied
6	**Classification & Prediction** Introduction to Classification and Prediction; Basics of Supervised & Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods, Classification by Decision Tree Induction, Tree Pruning, Rule-based Classification Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Bayesian Classification: Bayes' Theorem, Naïve Bayesian Classification. Prediction using Regression analysis.	10	CO6	Lectures with PPTs Flip Classroom Demonstration on ML tool	Evaluate	Class test Activity End Term: Theory Applied
7	**Cluster Analysis** Introduction to Cluster Analysis; Types of Data in Cluster Analysis; Classification	8	CO6	Lectures with PPTs Flip	Evaluate	Class test End Term: Theory

	of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based Method Partitioning Methods: K-Means and K-Medoids			Classroom ,Examples ,Demonstration on ML Tool		Applied

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Jiawei Han, Micheline Kamber	Data Mining: Concepts and Techniques	2011	Harcourt India Pvt.
2	Alex Berson, Stephen J. Smith	Data Warehousing, Data Mining and OLAP	2004	McGraw Hill
3	D. Hand, H. Mannila, and P. Smyth	Principles of Data Mining	2011	MIT Press

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www.tutorials.com
2	http://www.quora.com
3	http://www.edureka.com

MOOCs:

ResourcesNo.	Websiteaddress
1	Coursera
2	Swayam

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**Course Title**	
II	**205**	**Web Supporting Technologies**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

Course Objectives:

- To teach the basic internet concepts and train them to develop internet applications.
- An overview of the HTML specification
- Practical knowledge to implement HTML elements and attributes.
- Overview of JavaScript
- Overview of PHP

Course Outcomes:

CO1: The students will get information of the basics of internet with the help of examples. It will help them to identify and remember Web supporting concepts.

CO2: Remembering the definitions will help the students to understand basic concepts of HTML, JavaScript, CSS and PHP etc. In this subject, students will understand various tags, programming constructs of JavaScript, technical issues, cascading Style Sheets, forms and PHP concepts.

CO3: Students will Have thorough knowledge of HTML and JavaScript. They will be able to design various forms as per requirements. They will be able to apply CSS concepts in scripting. The students will also apply their creativity to display the output.

CO4: The students will relate real life problems with the JavaScript solution. They will analyze the problem and solve it.

CO5: Ability to use JavaScript construct for problem solving, handling technical issues etc.

CO6: Design and create their own forms for solving a real-life requirement.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Basics of Internet** Understanding internet and intranet, difference between internet and intranet, Introduction to WWW, Concept of client and server, Introduction to web server and web browser, using Apache as web server, Internet Service Providers (ISP)	4	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers
2	**Introduction to HTML** Overview of HTML, concept of Tag, types of HTML tags, structure of HTML program, Text Formatting Through HTML: Emphasizing Material in a Web Page, Using Image tag, attributes of Image tag, Lists: Using unordered, ordered, definition lists, Handling Tables: To define header rows & data rows, use of caption tag, changing height & width of table, BGcolor, Handling Tables: cell padding, cell spacing, colspan, row span, handling table data, images in table, Frames: Introduction To frames, using frames & framesets, named frames, Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, image as hyperlinks	8	CO1, CO2	Lecture with Ppts Case Study Demonstration in LAB	Apply (Analyse)	Case Study, Practical Assignments, End Term: Applied Questions
3	**Cascading Style Sheets** Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors, Using class and span tag, External style sheets	4	CO2, CO3	Lecture with PPTs Case Study in Computer LAB	Analyze	Case Study with Practical Assignments, Exams: Case based Questions/Applied Questions
4	**Introduction to JavaScript (Client-Side Scripting)** Introduction to scripting, overview of Java Script, advantages, client-side java Script, capturing user input, writing JavaScript into HTML,Advantages and limitations of JavaScript, **JavaScript Basics:** Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions, **JavaScript Programming Constructs:** Assignment, data declaration, if, switch, while,	8	CO1, CO3	Lectures with PPTs Demonstration in Computer LAB	Evaluate	Practical Assignments, End Term Exam: Short case and situation-based questions

	for, do while, label, break, continue, function call, return, with, delete, method of invocation **Dialog boxes** -Alert dialog box, prompt dialog box, confirm dialog box, window objects **JavaScript Functions**- Types of functions in Java Script- Built in functions, User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions Arrays- Introduction to arrays, arrays with methods					
5	**Forms** Interactive web pages concepts, difference between static & dynamic web pages, Concept of form, how form works, Different elements - text, password, button, submit, reset, checkbox, Radio, Text Area, select & option, properties of form elements, form object's Method, Other built-in Object: String object, math object, date object, Regular Expressions, Form validation	6	CO2, CO4	Lecture Case Activity, Demonstration in Computer LAB	Create	Practical Assignments, Exams: Case based Questions/Applied Questions
6	**JavaScript Events** What is an Event? Onclick Event Type, onsubmit Event Type, onmouseover and onmouseout, onchange, onload, onkeydown, working with DOM, Concept of Cookies and sessions, when and how to use cookies and sessions,	6	CO4, CO5	Lectures with PPTs Demonstration in Computer LAB	Evaluate	Practical Assignments, Exams: Case based Questions/Applied Questions
7	**Introduction to PHP** Server-side web scripting, Adding PHP to HTML, Syntax and Variables, PHP control structures, Establishing connectivity with MySQL database		CO4, CO6	Lectures with PPTs Demonstration in Computer LAB	Evaluate	Practical Assignments, Exams: Case based Questions/Applied Questions

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Bayross Ivan	Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGL	2015,3rd edition	Pearson Publication
2	Kogent Learning Solutions Inc	Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java,	1thedition	Dreamtech Press

		Jsp, XML and Ajax,		
3	Danny Goodman and Michael Morrison	JavaScript Bible	7th edition	John Wiley & Sons Inc

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www.w3schools.com
2	www.devguru.com

MOOCs:

ResourcesNo.	Websiteaddress
1	www. edx.com
2	www.coursera.com
3	Swayam

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
II	**206**	**Lab on Data Structures using Python**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IE:UE	40:60

Course Objectives:

- TocreateDynamicandEffectiveBusinessProfessionalsandLeaders.
- Totransformtheindividualstocatertotheneedsofthesocietyandcontributetonation building
- Todevelopentrepreneurstoregisterdifferentaspectsoftheirbusinessunderremedialin dividualand teambehavior.
- ToimproveOrganizationalBehaviorbyhavingasoundknowledgeofculturaldifferences.

CourseOutcomes:

CO1: Understand Python syntax and semantics and apply Python flow control and functions, libraries.
CO2: Understand Python Programs using core data structures like Lists
CO3: Understand and apply Linked list, Tree, Searching, Sorting
CO4: Apply the concepts of Object-Oriented Programming for Python

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Informal introduction to programming, algorithms and data structures via gcd, Downloading and installing Python,gcd in Python: variables, operations, control _flow - assignments, conditionals, loops, functions. **Suggested Programs** Installation of Python IDE, understand various platforms for Python (google collaborator, Jupitar notebook) • Basic program to understand Data Types • creating variables, accepting input variable from user and printing their datatype • Mathematical functions (apply various operations on data +, -, /, *) • Conditional Statements (if, else, , • Create functions to o Find average of marks of five subjects Find sum of first n prime numbers	8	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	Python: types, expressions, strings, lists, tuples, arrays | Python memory model: names, mutable and immutable values | List operations: slices etc - Binary	8	CO 1	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied Questions

	search | Inductive function denitions: numerical and structural induction | Elementary inductive sorting: selection and insertion sort | In-place sorting. **Suggested Programs** • Operations on Strings, Lists , tuples and arrays o Creating lists/tuple/array and accessing list elements using index o Access the list/tuple element using –ve index o Extract specific element from list/tuple/array o Use len(), del(), remove() and range functions on list/tuple Applying different searching and sorting algorithm on data (list)					
3	Basic algorithmic analysis:inputsize,asymptotic,omplexity,O() notation | Arrays vs lists | Merge sort | Quicksort | Stable sorting. Dictionaries | More on Python functions: optional arguments, default values | Passing functions as arguments | Higher order functions on lists: map, lter, list comprehension. **Suggested Programs** • Write a program for sorting given list using Quick Sort • Fuction calling (passing the variables) o Find factorial of a number o Find fibbonacci series for a given number • Create Dictionaries with key,value pair, and access various elements of Dictioneries, Various operation using Dictionaries. • Usage of map, lter functions on list	8	CO 3	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	Exception handling | Basic input/output | Handling files | String processing. **Suggested Programs** • Read, write, search	8	CO1	Lectures with PPTs Group Activity	Evaluate	Group Activity End Term Exam: Short

	operations on File data structure • Write Programs based on exception handling • Write program for various operations on string variables			Video Cases		case and situation based questions
5	Backtracking: N Queens, recording all solutions | Scope in Python: local, global, nonlocal names | Nested functions | Data structures: stack, queue | Heaps. **Suggested Programs** • Creation and various operations on Stack • Creation and various operations on queue • Creation and various operations on heap Defining scope variables in Python	8	CO2	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	Abstract datatypes | Classes and objects in Python | "Linked" lists: find, insert, delete | Binary search trees: find, insert, delete | Height-balanced binary search trees. **Suggested Programs** • Creation of class data structure ,Abstract classes • Creation of Link List and various operations on Link List Implementation of tree data structure using class concept	8	CO4	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied
7	Efficient evaluation of recursive denitions: memoization | Dynamic programming: examples | Other programming languages: C and manual memory management | Other programming paradigms: functional programming. **Suggested Programs** Comparison of all discussed algorithm with their implementation in C and compare memory usage					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Michael T. Goodrich (Author), Roberto Tamassia (Author), Michael H. Goldwasser (Author)	Data Structures and Algorithms in Python Paperback	2016	WILEY PUBLICATION
2	NarasimhaKarumanchi	Data Structure and Algorithmic Thinking with Python Paperback	2015	
3	Hemant Jain	Problem Solving in Dat Structures & Algorithm Using Python: Programming Interview		

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/python/index.htm
2	https://www.javatpoint.com/python-tutorial
3	https://www.w3schools.com/python/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL
2	UDEMY

Semester	Course Code	Course Title	
II	**209**	**Foreign Language**	
Type	**Credits**	**Evaluation**	**Marks**
???	2	IE	50

Guidelines for the Foreign language : The head of the institution/Head of the Department should select any of the foreign language according to the availability of resource person and current market demand.

Semester	CourseCode	CourseTitle	
II	209	Digital Technology	
	Prepared By	Dr. Dhanashri Vinay Sahasrabuddhe	
Type	Credits	Evaluation	Marks
???	2	IE	50

CourseObjectives:

- To understand, communicate and adapt to a digital world as it impacts their personal life, society, and the business world.
- To actively engage students in the processes of analysing problems and opportunities, designing, developing and evaluating digital solutions, and creating and sharing information that meets a range of current and future needs.
- To learn and ethically exploit the capacity of information systems to create digital solutions.

CourseOutcomes:

CO1 : Understand concept and terms of digital technology and its role in life of student and teacher

CO2 : Apply digital technology in teaching learning process

CO3 : Understand role of latest digital technologies in various fields

Unit No.	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction:** Introduction to Digital Technology, Purpose of Digital Technology, History of Digital Technology, Scope of Digital Technology, Examples of Digital Technology: social media, online games, multimedia and mobile phones. Benefits and challenges of digital technologies in the classroom.		CO1, CO2	Lecture with PPTs	Understand	Quiz, writing short answers, topic presentations
2	**Terms are associated with digital technology:** Bring your own device (BYOD), E-portfolios, Flipped classroom, Personal Learning Network (PLN), Virtual Learning Environment (VLE), Interactive Whiteboards (IWB), Software Applications (Apps), Web 2.0, Telecommunication, Fibre Optics, Cellular Telephones, Digital printing, pulse code modulation (PCM)		CO1	Lecture with PPTs	Understand	Quiz, writing short answers, topic presentations
3	**Types of Digital Technology:** Artificial Intelligence (AI):	6	CO1, CO2, CO3	Lectures with PPTs,	Understand, Apply	Presentations, Quiz, writing short answers

	Introduction, Applications, scope, history Advantages and Disadvantages, Machine Learning (ML) : Introduction, Applications, scope, history Advantages and Disadvantages Deep Learning (DL) : Introduction, Applications, scope, history Advantages and Disadvantages					
4	**Digital Learning:** Types, Technology and Methods of Teaching and Learning		CO1, CO2	PPTs,	Understand, Apply	Quiz, writing short answers
5	**Support System:** Support system for teachers and students to use of digital technologies in the classroom, SAMR (Substitution, Augmentation, Modification, Redefinition) model developed by Dr Ruben Puentedur		CO1, CO2	PPTs,	Understand, Analyze, Apply	Quiz, writing short answers, Topic Presentations

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
-	-	-	-	-

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.education.vic.gov.au/school/teachers/teachingresources/digital/Pages/teach.aspx
2	https://www.encyclopedia.com/history/dictionaries-thesauruses-pictures-and-press-releases/digital-technology
3	https://www.cambridgeinternational.org/Images/271191-digital-technologies-in-the-classroom.pdf
4	https://www.digitaled.in/blogs/digital-learning-types-technology-and-methods-of-teaching-and-learning/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
II	**209**	**Human Psychology at Workplace**	
	Prepared By	**Prof. Dextor Woodward**	
Type	**Credits**	**Evaluation**	**Marks**
???	2	IE	50

CourseObjectives:

- To expose the students to the fundamentals of Human Psychology - such as working with people, nature of organizations, communication, leadership and motivation of people.
- To help students develop a conceptual understanding of Behavioral theory theories
- To enable the students to put the ideas and skills of Psychology into practice

CourseOutcomes:

CO1:To understand the dynamics of individual and Human Psychology andrelationships.
CO2: To understand the importance of human behavior in managerial functions

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Foundations of Individual Behavior** Attitudes and Job Satisfaction, Components of Attitude, Major Job Attitude, Job Satisfaction, Personality and Values, Personality Determinants, MBTI, Big – Five Model, Values, Formation, Types of Values, Perception, Factors influencing perception	4	CO1, CO2	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Motivation and Leadership :**MotivationandLeadershipConceptofmotivation,Definition,TheoriesofMotivation,Maslow'sneedTheory,ERGTheory,TheoryXandTheoryY,TwoFactorTheory, McClelland‟sTheory,EquityTheory,Vroom‟sExpectancyTheory. ConceptofLeadership,Theoriesofleadership,TraitsofgoodLeader,DifferencebetweenLeaderandManager	8	CO1, CO2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied Questions
3	**Groups and Teams:** Concept of OB, Foundations of Group Behaviour, Formation of Group, Group Classification, Properties, Roles, norms, status, size and cohesiveness, Group decision making, Understanding teams, creating effective teams, Conflict Process, Conflict management communication	8	CO1, CO2	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions

4	**Culture** Culture Definition, Culture's function, need and importance of Cross Cultural management, Stress and its Management.	5	CO2	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	KavitaSingh	Organizational Behaviour	2015,3rd edition	Pearson Publication
2	Robbins, TimothyJudge,SeemaSanghi	OrganizationalBehaviour	12thedition	StephenPearsonPrenticeHall
3	MNMishra	OrganizationalBehaviour	2010	VikasPublishingHousePvt. Limited
4	FredLuthans	Organizational Behaviour	13thedition	McGrowHill Inc
5	JohnNewstromand KeithDavis	Organizational Behaviour	11thedition	TataMcGrow Hill

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www.bretlsimmons.com
2	https://www.ted.com/talks/shawn_achor_the_happy_secret_to_better_work?language=en
3	www.positivesharing.com
4	https://www.ted.com/talks/dan_pink_the_puzzle_of_motivation?language=en
5	https://www.ted.com/talks/simon_sinek_how_great_leaders_inspire_action?language=en

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
III	**301**	**Software Design Patterns**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

Pre-Requisite

This course assumes students should have following knowledge:

- OOAD and UML.
- Software Engineering
- Java Programming

CourseObjectives:

- Able to describe features of specified design pattern
- Analyze a software development problem and able to identify patterns can be used to solve a problem.
- Able to distinguish various design pattern and applicability of each.
- Design a software module to use software patterns to solve problem

CourseOutcomes:

Attheend ofthiscourse, studentshouldbe ableto

CO1: Identify the Intent and structure/framework of a given design pattern

CO2: Able to describe the applicability and role of participants for a design patterns

CO3: Suggest and apply a design pattern for the given problem

CO4: Analyze the applicability of using design patterns for a given problem

CO5: Able to evaluate and assess the design pattern that are appropriate for a given problem

CO6: Create software design using design patterns that are scalable, robust and maintainable

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Design Patterns** Reusable design Patterns: Meaning & Use of Design Patterns, Organizing the Patterns, describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in	4	CO2	Lecture with PPT	Understand	Short Answers

	various cases. Selection of a Design Pattern					
2	**Creational Patterns** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences and Implementation of following Creational Patterns: - Factory Method, Abstract Factory, Builder, Prototype, Singleton. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Creational design pattern.	**8**	CO1 CO2	Lecture with PPT, Hands On Demo	Remember Understand and apply	Quiz, Case Study Assignment
3	**Structural Patterns** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of Following Structural Patterns Adapter (class), Adapter (object), Bridge, Composite, Decorator. Façade, Flyweight, Proxy. Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Structural design patterns	**8**	CO1 CO2 CO3	Lecture with PPT, Hands On Demo	Remember, Understand and apply	Class Test Quiz Case Study Presentation Quiz
4	**Behavioral Patterns – I** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Interpreter, Template Method, Chain of Responsibility, Command, Iterator Tutorial: Tutorials should be conducted in LAB	**8**	CO1 CO2 CO3	Lecture with PPT, Hands On Demo	Remember, Understand and apply	End Term Exam: Short case study Assignment

	using JAVA for implementing Behavioral Patterns – I					
5	**Behavioral Patterns–II** Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern Mediator, Memento, Observer, State, Strategy, Visitor Tutorial: Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Patterns – II	**8**	CO1 CO2 CO3	Lecture with PPT, Hands On Demo	Remember, Understand and apply	Class Test Quiz Case Study Presentation Quiz
6	**JEE Patterns** Presentation Layer Design Pattern, Business Layer Design Pattern, Integration Layer Design Pattern Tutorial: Tutorials should be conducted in LAB using JAVA for implementing above Patterns	**6**	CO1 CO2	Lecture with PPT	Remember, Understand	Quiz
7	**Case Study** - Designing a parking lot - Designing Movie Ticket Booking System - Design Logistic System - Online Hotel Booking System OYO	**4**	CO4 CO5 CO6	Lecture with PPT, Can be covered along with patterns applicability	Analyze, Evaluate and Create	Assignment Submission

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Erich Gama, Richjard Helm, Ralph Jonson and Jon Vlissides	Design Patterns Elements of Reusable Object-oriented Software-	October 1994	Addison-Wesley Professional
2	Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,	Head First Design Patterns	November 2004	O'Reilly
3.	Craig Larman	Applying UML and Patterns	2001,2015	Pearson Education

MOOCs:

Resources No.	Websiteaddress
1	https://nptel.ac.in/courses/106/105/106105224/

Web Resources

Resources No.	Websiteaddress
1	https://www.tutorialspoint.com/design_pattern/index.htm
2	https://www.javatpoint.com/design-patterns-in-java
3	http://www.vincehuston.org/dp/

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
III	**302**	**Artificial Intelligence**	
	Prepared By	**Dr.Suvarna Mahavir Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE:UE	40:60

CourseObjectives:

- Learn AI and its foundations.
- Become familiar with basic of AI for problem solving, inference, knowledge representation, and learning.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

CourseOutcomes:

CO1: Understandand apply fundamentals of Artificial intelligence (AI)
CO2: Apply basic principles of AI in solutions that require problem solving, inference, knowledge representation, and learning.
CO3: Apply AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
CO4: Demonstrate use of concept for developing applications using Numpy and Pandas

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction** What is AI? ,The AI Problems, Background/history, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, High-level overview of field, State of the art.	4	CO 1	Lecture with Ppts	Understand	Short Answers
2	**Introduction and historical perspective, Hard and Soft AI** Disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, Problems, State Space Search & Heuristic Search Techniques: Defining The Problems as A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems.	7	CO2	Lecture with Ppts	Analyse	Short Answers

	Generate – And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.					
3	**Knowledge Representation Issues** Representations And Mappings, Approaches To Knowledge Representation. Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning	6	CO 3	Lecture with PPTs	Analyse	Short Answer
4	**Symbolic Reasoning under Uncertainty** Introduction To Non-monotonic Reasoning, Logics For Non monotonic Reasoning. Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic.	5	CO3	Lectures with PPTs	Understand	Short Answer
5	**Natural Language Processing** Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, Discourse And Pragmatic Processing, Spell Checking. Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed	5	CO2	Lecture	Understand	Short Answer

	Representations, Connectionist AI And Symbolic AI.					
6	**Introduction to machine learning** IntroductionMachine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, , **Introduction to Numpybasics**, creating numpy arrays ,structure and content of arrays, subset, slice, index and iterate through arrays, multidimensional arrays, python lists vs numpy arrays, introduction to numpy operations on numpy arrays , operations on arrays basic linear algebra operations	7	CO4	Lectures with PPTs Classroom	Apply	Short Answer
7	**Introduction to pandas** Introduction, pandas basics, indexing and selecting data, merge and append, grouping and summarizing data frames, lambda function & pivot tables, reading delimited and relational databases, reading data from websites, getting data from apis, reading data from pdf files, cleaning datasets. **Case study**: For example, to explore a dataset stored in a CSV on your computer. Pandas will extract the data from that CSV into a Data Frame — a table, basically — then let you do things like: Calculate statistics and answer questions about the data, like 1) What's the average, median, max, or min of each column? 2) Does column A correlate with column B? 3) What does the distribution of data in column C look like? 4)Clean the data by doing things like removing missing values and filtering rows or columns by some criteria 5) Visualize the data with help	8	CO4	Lecture with Demo	Create	

	from Matplotlib. Plot bars, lines, histograms, bubbles, and more. 6)Store the cleaned, transformed data back into a CSV, other file or database					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Stuart Russel, Peter Norvig	Artificial Intelligence : A Modern Approach		
2	Chandra S.S.V	Artificial Intelligence and Machine Learning		PHI
3	Elaine Rich And Kevin Knight	"Artificial Intelligence"		Tata McGraw-Hill
4	Patterson	Introduction to Artificial Intelligence and Expert System		Prentice Hall India.
5	Shai Shalev-shwartz, Shai Ben-David	Understanding Machine Learning from Theory to algorithms,		Cambridge University press
6	Nilson, Elesevir	Artificial Intelligence A New Synthesis		

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**303**	**Information Security**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	4	IE: UE	40:60
Cognitive Abilities:			
Course Outcome as per Blooms Taxonomy			
CourseOutcomes:			

CO1: Using some basic concepts of software development and software engineering Information can be understood and remembered .

CO2: By remembering students the basing concepts students will understand the concepts of Information , Characteristics , Levels of Information, Information Security Measures and various stages in Information testing Life Cycle .

CO3: Students will Have thorough knowledge about Measures of Information Security and Cyber security at higher level , network security measures and various scanner and cleaners

CO4: To Measure the risk of Information loss or theft and over come the Information Security by scientific and proper methods

CO5: Ability to select proper method to protect the information from misuse and make the organization full proof from various Information threats.

CO6: Design and create their own procedure to protect the important data and information at all the levels.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction and Background** Basic concepts of Information, Information Characteristics, sources of Information, Types of Information, Generating Information in Organizations. Business Application of Information and Information System, What is Information security? Need for Information Security , Types of Organization , Functions of Business organization , Levels	5	CO 1	Lecture with Ppts Quiz	**Remembering**	Quiz End Term Internals:Short Answers

	of Organization , How Organizations manage the information , flow of information.					
2	**Basics of Networking for Security Purpose.** Network Installations, Types of Networks and their security issues, Types of Network of OS. Functions of Information security officer. Different measures to safe guard the important information in the organization. Network policy for protecting important resources of the Network. Basic concept of MIS and Organization flow of Information.	8	CO 2	Lecture with Ppts Case Study	**Understanding**	End Term Exam: Short case and situation based questions
3	**Importance of Information Security.** Improvement in corporate reputation based on the height of the level of information security, threat to business continuity due to accidents related to information systems, cyber space, information assets, threats, and vulnerabilities. Information Security Measures. **Threats** :- Ty p e s of threats physical threats (accident, disaster, fault, destruction, theft, unauthorized intrusion, etc.), technical threats (unauthorized access, eave S dropping , spoofing, alteration, error, cracking, etc.), man-made threats (operational error, loss, damage, peep, unauthorized use, social engineering, etc.), cyber-attack, information leakage, intent, negligence, mistake, fraudulent behavior, sabotage, DoS attack, rumor, flaming, SPAM e-mail, file sharing software [Malware / malicious programs] computer virus, macro virus, worm, bot (botnet, remote operated virus), Trojan horse, spyware, ransom ware, key logger, root kit, backdoor, fake anti-virus	7	CO 2	Lecture with PPTs Case Study	**Understanding**	End Term Exam: Short case and situation based questions

	software					
4	**Information security technology (cryptography). CRYPTREC** ciphers list, cryptography (encryption key), decryption (decryption key), decoding, symmetric cryptography (common key), public key cryptography (public key, private key)), AES (Advanced Encryption Standard), S/MIME (Secure MIME), PGP (Pretty Good Privacy), hybrid encryption, hash function (SHA-256, etc.), key management, disk encryption, file encryption, compromise. digital signature (signature key, verification key), timestamp (time authentication), message authentication, MAC (Message Authentication Code), challenge-response authentication. **Human assets** (people, and their qualifications, skills, and experience), intangible assets, service, risk management (JIS Q 31000), monitoring, information security events, information security incidents.	7	CO3, CO4	Lectures with PPTs Group Activity Case Study	**Applying, Analyzing**	End Term Exam: Short case and situation based questions
5	**Information security Management.** Management of information based on the information security policy, information, information assets, physical assets, software assets **Risk analysis and evaluation (Information asset review / Classification)** information assets review, classification and management by importance of information assets, information assets ledger Risk analysis and evaluation (Risk type)loss of property, loss of responsibility, loss of net earnings, human cost, operational risk, supply chain risk,	7	CO5	Lectures with PPTs Group Activity Case Study	**Evaluating**	Group Activity End Term Exam: Short case and situation based questions
6	**Information security regulations.**	8	CO6	Lectures with PPTs	**Creating**	Group Activity

	(Company regulations including information) security policy) organizational operation according to the information security policy, information security policy, information security purpose, information security measures criteria, information management regulations, security control regulations, documentation control regulations, regulations on measures to be taken against computer virus infection, regulations on measures against accidents, information security education regulations, privacy policy (personal information protection policy), employment agreement, office regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedure for approving regulations			Group Activity Case Study		End Term Exam: Short case and situation based questions
7	**Management of Information Asset.** Security Incidents management, reducing risk in Information loss and keeping the information safe from unauthorized users and threats . **Information Technology Act**, Cyber Crimes and Cyber Laws. -What are cyber-crimes? Types of cyber-crimes. Categories of Cyber Crime, Online business threats , Online business frauds Safety tips for online business. , IT Policy for Information protecting. risk involved in usage of external service, risk involved in distribution of information by SNS, moral hazard, estimated annual loss, scoring method, cost factor	8	CO6	Lectures with PPTs Group Activity Case Study	**Creating**	Group Activity End Term Exam: Short case and situation based questions

Text Books	1. Information Security Management Handbook, Sixth Edition, Volume 5-2012 Amazon BooksEdited by - Micki Krause Nozaki, Harold F. Tipton. 2. Cyber Security Understanding Cyber Crimes, Computer Forensics and

	Legal Perspectives Nina Godbole and SunitBelpure, Publication Wiley. 3. Information Security: Principles and Practice 1st , Kindle Edition -2005 Amazon BooksAuthor - Mark Stamp 4. "Cryptography and information Security" V.K.Pachghare, PHI Learning Private Limited, Delhi India. 5. Analyzing Computer Security by Charles P. Pfleeger, Shari LawerancePfleeger, Pearson Education India 6. Anil Gaikwad , JyotiBiradar (Patil) "Basic Concepts of System Analysis" Lambert Academic Publication Dec. 2019 .
Reference Books	1. Practical Information Security Management: A Complete Guide to Planning and Implementation-Dec-2016 Amazon Books . Tony Campbell 2. Managing Risk and Information Security :- Protect to Enable 3. Anil Gaikwad , JyotiBiradar (Patil) Software Project Management Made Easy Lambert Academic Publication Dec 2019.

MOOCson NPTEL:

Resour cesNo.	Websiteaddress
1	https://nptel.ac.in/courses/,
2	http://www.freetechbooks.com/managing-risk-and-information-security protect-to-enable-t1150.html

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	306	**Lab on Software Testing**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	IE:UE	40:60

CourseObjectives:

Course Objectives:
1. To introduce students to the fundamental concepts software testing
2. To familiarize students with various techniques of performance testing, security testing, mobile testing, API testing, and continuous testing. Various types of testing tools and best practices for each testing domain.
3. To provide students with practical hands-on experience in software testing through case studies and lab exercises.
4. To equip students with the necessary skills and knowledge to design effective test cases, manage defects, and report test results.
5. To emphasize the importance of change management, configuration management, and risk analysis in software testing.

CourseOutcomes:

Course Outcomes:
CO1:Students will be able to demonstrate a solid understanding of performance testing, security testing, mobile testing, API testing, and continuous testing concepts.

CO2:Students will be proficient in using various testing tools and applying best practices for each testing domain.

CO3:Students will have acquired practical experience in software testing through hands-on lab exercises and case studies

CO4:Students will be able to design effective test cases, manage defects efficiently, and report test results accurately.

CO5: Students will to use various testing tools ,understand the significance of change management, configuration management, and risk analysis in software testing and apply these principles in real-world scenarios.

Unit No	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Software Testing basics** Basic testing vocabulary, Quality assurance versus Quality control, Cost of quality, Software quality factors, How quality is defined? Why do we test software? What is a defect?, The Multiple roles of the software tester, Scope of testing, When should testing occur?, Testing constraints, Life cycle testing, Independent testing, Levels of testing, The "V" Concept of testing	5	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals: Short Answers

2	**Testing Techniques and test administration** Structural versus Functional Technique Categories, Verification versus Validation, static versus Dynamic Testing, Examples of Specific Testing Techniques like white box testing and black box testing, Test Planning, Customization of the Test Process, Budgeting, Scheduling	10	CO 2	Lecture with Ppts Case Study With case tool	Apply (Analyze)	Case Study , Business cases End Term: Applied Questions
3	**Create the Test Plan** Prerequisites to test planning, Understand the Characteristics of the Software Being Developed, Build the Test Plan, Write the Test Plan. Study of test management tool: Test Director	10	CO 3	Lecture with Ppts Case Study With case tool	Analyze	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Test cases** Test Cases, Test case Design, Building test cases, Test data mining, Test execution, Test Reporting, Defect Management, Test Coverage – Traceability matrix Test Metrics – Guidelines and usage, Test reporting: Guidelines for writing test report, Test Tools used to Build Test Reports Manual testing Case Study Requirements / User Story Study Hands on Test planning Hands on Test design Hands on Test execution Hands on	10	CO 4	Lectures with PPTs Group Activity , Case Study With case tool	Evaluate	Group Activity End Term Exam: Short business cases and situation based questions
5	**Managing Change** Software Configuration Management, Change Management, Risks: Risk Analysis and Management with examples, User Acceptance testing: in detail explanation with details Case Study: How to test web, stand alone and database applications – with examples. Help with resume and testing interview skills **Automation testing tools** Study of bug tracking tool:	10	CO 5	Case Study With case tool	Analyze / Evaluate	Case study Presentation Activity End Term: Practical Applied Questions

	Bugzilla. Study of winrunner, study of web testing tool selenium. Study of open source testing tool: test link, Case study for automation testing					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Publisher Company
1	Hetzel	The Complete Guide to Software Testing,	John Wiley & Sons
2	RenuRajani and Pradeep Oak	Software Testing	Tata McGraw-Hill

Online Resources:	1. Testing in 30+ Open Source Tools, Rahul Shende, Shroff Publishers & Distributor Pvt. Ltd, ISBN 13: 9789350231005 (page numbers from 15 to 117) 2. http://seleniumhq.org/ 3. http://sourceforge.net/projects/sahi/ 4. http://testng.org/doc/index.html
MOOC on NPTEL	www.SWAYAM.com www.NPTEL.com www. edx.com www.coursera.com

Semester	CourseCode	CourseTitle	
III	309	Social Change in Technology	
	Prepared By		
Type	Credits	Evaluation	Marks
	2	IE	50

CourseObjectives:

- Understand the Concept of Social Change
- Examine the Role of Society in Facilitating Change
- Explore Social Change as a Dynamic Concept
- Examine Existing Theories of Social Change
- Analyze Innovation and Invention as Drivers of Social Change

CourseOutcomes:

CO1: Understand the Impact of Technology on Social Change:

CO2: Critically Evaluate the Ethical and Societal Implications of Technological Innovation:

Unit No.	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Social Change :** What is Social change , Role of society in change, social change as a dynamic concept , existing theories of social change., innovation and invention as a social process for social change	6	CO 1	Lecture with PPTs, Guest Lectures	Understand, Apply, Analyze	Quiz, writing short answers
2	**Discovery Social change :** Link between education and social change ,concept of Science and Technology, role of technology in social change, Causes and Effects of Technology in social changes, discovery as a social process for social change and technological development, trends of technology, social processes that are involved in the development of technologies and social change	6	CO2,	Lecture with PPTs, Guest Lectures	Understand, Analyze, Apply	Quiz, writing short answers
3	**Digital divide and social change :** Computers, equity, education and digital divide, technology & work/business, Role of ICT	6	CO1	Lecture with PPTs, Guest Lectures	Understand, Analyze, Apply	Quiz, writing short answers

	in government & military, technological development and resulting social changes emanating from the information revolution, relationship of social change to the development, impact and diffusion of printed materials, Internet, email and social media in society.			Workshop on use of Social Media / Digital Media		
4	**Social issues caused by the rise in technology** : Computer crime and security, Intellectual property and responsible computing, identify and evaluate past, present, and potential future political and ethical issues involving technology and economy	6	CO2	Lectures PPTs, Guest Lectures Cyber Experts	Understand, Analyze, Apply	Quiz, writing short answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Nolan & Lenski	Human Societies as Sociocultural System	1983	Oxford University Press

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.youtube.com/watch?v=0dK3mL35nkk
2	http://www.researchchannel.org/mov/usc_ctt_reltec_250k_qt.mov

MOOCs:

ResourcesNo.	Websiteaddress
1	www.SWAYAM.gov.in

Semester	CourseCode	CourseTitle	
III	309	Water Management	
	Prepared By		
Type	Credits	Evaluation	Marks
	2	IE	50

CourseObjectives:

- Develop a Comprehensive Understanding of Water Systems
- Analyze the Impacts of Human Activities on Water Resources
- Explore Sustainable Water Management Approaches
- Assess Policy and Governance Frameworks in Water Management
- Develop Skills for Effective Water Management Decision-making

CourseOutcomes:

CO1: Understand the Principles and Challenges of Water Management:

CO2: Apply Effective Strategies for Sustainable Water Management

Unit No.	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction:** Sources and Uses of water (primary, secondary and tertiary sector uses); Concept of virtual water; Health and environmental concerns of availability and quality of water resources.	6	CO 1	Lecture with PPTs, Expert Lectures by Medical Dr	Understand, Apply, Analyze	Quiz, writing short answers
2	**Crisis in Water Resources:** Water crisis and water stress; Protection of aquifers; Water rights and its legal implications; Politics of water sharing	6	CO2, CO1	PPTs, Lectures Lectures by Water Right Activists	Understand, Analyze, Apply	Quiz, writing short answers
3	**Water Resources Planning and Management:** Necessity, System components, planning scales, Approaches, planning and management	6	CO1	PPTs, Guest Lectures by Environment Experts on water	Understand, Analyze, Apply	Quiz, writing short answers

	aspects, Analysis, Models for impact prediction and evaluation, Adaptive Integrated Policies, Post Planning and management Issues			managemen t		
4	**Water Harvesting and Conservation:** Water Harvesting Techniques – Micro-catchments - Design of Small Water Harvesting Structures – Farm Ponds – Percolation Tanks – Yield from a Catchment, Rain water Harvesting-various techniques related to Rural and Urban area.	6	CO2	Lecture PPTs, Visit to catchment areas Lakes Water Haversting	Understand , Analyze, Apply	Quiz, writing short answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1.	K. Subramanya	Engineering Hydrology,		Tata McGraw Hill Publishers, New Delhi
2.	H.M. Raghunath	Ground Water		Wiley Eastern Publication, New Delhi
3.	Daniel P. Loucks and Eelco van Beek	Water Resources Systems. Planning and Management,		UNESCO Publication.
4	Mollinga,	Integrated Water Resources Management Water in South Asia Volume I	2006.	Sage Publications,
5	Singh, Chhatrapati	Water Rights in India, Ed	1992	The Indian Law Institute, New Delhi
6	Dhruva Narayana, G. Sastry, V. S. Patnaik	Watershed Management	1997	ICAR Publications

Online Resources

OnlineResourcesNo.	Websiteaddress

1	**Central Water Commission (cwc.gov.in)**
2	National Institute of Hydrology (nihroorkee.gov.in):
3	India Water Portal (indiawaterportal.org):
4	National Water Mission (nationalwatermission.gov.in):

MOOCs:

ResourcesNo.	Websiteaddress
1	"Water Resources Management and Policy" on Coursera
2	

Semester	Course Code	Course Title	
III	309	Economics for IT Industry	
	Prepared By		
Type	Credits	Evaluation	Marks
	2	IE	50

CourseObjectives:

- To study changes in the environment in which firms operate influence their decision-making and outcome
- To acquaint learners with basic concepts and techniques of economic analysis and their application to managerial decision-making in the IT industry.
- To prepare the students for the use of various economics terminologies and techniques in IT industry.
- To understand recent developments in the economic situation and its impact on economic decision making.

CourseOutcomes:

CO1: Understand the Economic Principles Shaping the IT Industry:

CO2: Apply Economic Analysis to IT Decision-Making

Unit No.	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction Economics and IT industry** Meaning and scope of Industrial Economics . Need and importance of industry economics. IT industry and its contribution to the Indian Economy. Factors hindering the IT Industry in India Writing functions: Need of functions/methods, Writing and using static method; concepts of passing values and returning	6	CO 1	Lecture with PPTs,	Understand, Apply, Analyze	Quiz, writing short answers
2	**Theory of Demand and Supply** Theory of Demand Supply Law of Demand and Supply. Elasticity of demand . Supply and demand chain	3	CO1, CO2	PPTs, Case Studies	Understand, Analyze, Apply	Quiz, writing short answers
3	**Theory of company /Firm** : Size and structure of the company Size and structure of the IT	6	CO1	PPTs, Lectures Case Study	Understand, Analyze, Apply	Quiz, writing short answers

	industry in India Technological View of the firm Marketing Boundaries Determining the marketing boundaries ans Structure Competition Price output- log run/ short run Monopoly			of IT industries		
4	**Macro economics** Macroeconomics Competition and industrial Policy Current issues in the IT industry and Competition Government and IT industry policies R& D in It Industry Government Monetary policy and its impact in IT industry	6	CO1, CO2	Lectures Case Study on current issues and government policies	Understand, Analyze, Apply	Quiz, writing short answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	DN Dwivedi	Managerial Economics		Vikas Publishing
2.	G.S Gupta	Managerial Economics and Micro Economic		McGraw Hill Education India
3.	R.Dornbusch, S.Fischer	Macro Economics		McGraw Hill Education India
4	A V Desai	Factors underlying the slow growth of Indian industry		Oxford University Press.

Online Resources

OnlineResourcesNo.	Websiteaddress
1	www.rbi.org.in
2	www.economicshelp.org
3	www.economist.com
4	www.federalreserve.gov

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL

Programme:MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-01(A)**	**Virtualization**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To create Dynamic and Effective Business Professionals and Leaders.
- To transform the individuals to cater to the needs of the society and contribute to Nation building
- To develop entrepreneurs to register different aspects of their business under remedial individual and team behavior.
- To improve Organizational Behavior by having a sound knowledge of cultural differences.

CourseOutcomes:

CO1: How to provide Flexible and scalable infrastructures as per user requirement.
CO2: Understanding the components of Virtualization
CO3: Carrying out practical's through Virtualization.
CO4: The case studies will help us to understandmore of practice of cloud computing in the market.
CO5: Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
CO6: Creating flexible and scalable infrastructure suitable to the organizational need.

Unit	CONTENT	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Overview Of Virtualization** Introduction to Virtualization, Virtualization Approaches, Virtualization for Server Consolidation and Containment, Hardware Support for Virtualization, Para-Virtualization, vmWare's Virtualization Solutions	07	CO 1	Lecture with Ppts/practical's	Understand	Quiz End Term Internals:Short Answers
2	**Understanding Virtualization** The Roots of Virtualization, Making Better Use of Your Systems with Virtualization, Approaches to Virtualization, Understanding the Virtualization Ecosystem, Reasons to Invest in Virtualization Hardware. **vmWare :** what is VmWare, Virtulization with Vmware, VmWareProducts,Data Center and Cloud Infrastructure, Networking and Security, SDDC Platform, Storage and Availability, The vmWare Approach to the Cloud, vmWare vSphere 4, Server Consolidation and Containment	07	CO 1	Lecture with Ppts/practical's	Understand	Case Study , Newspaper Article End Term: Applied Questions
3	**Hypervisor** What is Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, Types of Hardware Virtualization : Full Virtualization, Emulation Virtualization, Para virtualization., Installing Hyper-V In Windows Server 2012,	07	CO 3	Lecture with Ppts/practical's	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Types Of Virtualization** Server Virtualization, Client & Desktop Virtualization Services and Applications Virtualization, Network Virtualization, StorageVirtualization	07	CO1	Lecture with Ppts/practical's	Evaluate	Group Activity End Term Exam: Short case and situation based questions

5	**Tools For Virtualization** Virtualization with Xen, Virtualization with Bochs and QEMU, Virtualization with Lguest, Virtualization with KVM	05	CO2	Lecture with Ppts/practical's	Create	Case Presentation Activity End Term: Theory Applied
6	**Virtualization For Businesses** Need for Virtualization in a Business, Implementation of Virtualization in a Business, Cost-Benefit Analysis of Virtualization	05	CO4	Lecture with Ppts/practical's	Apply (Analyse)	Activity End Term: Theory Applied
7	**Openstack And Its Role In Virtualization** Understanding Openstack, nine Core key components of openstack. CASE STUDIES OF VIRTULIZATION : Xen Hypervisor, OpenVZ Hypervisor, MS Virtual Server 2005 R2, Oracle VM	05	CO5	Lecture with Ppts/practical's/ CASE STUDIES	Apply (Analyse)	Case Presentation Activity End Term: Theory Applied

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Dan Kusnetzky	"Virtulization" – A Manager's Guide	2010	O'reilley Publications
2	Bernard Golden	"Virtulization for Dummies"	2007	Wiley

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.geeksforgeeks.org
2	http://www.thinkitsolutions.com
3	http://youtu.be/tPtrk-OV3VO?si=-LmAiS2KPxtei1y

MOOCs:

ResourcesNo.	Websiteaddress
1	http://onlinecourse.nptel.ac.in
2	swayam.gov.in

Programme:MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-01(B)**	**Amazon Web Services**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- TocreateDynamicandEffectiveBusinessProfessionalsandLeaders.
- Totransformtheindividualstocatertotheneedsofthesocietyandcontributetonation building
- Todevelopentrepreneurstoregisterdifferentaspectsoftheirbusinessunderremedialindividualand teambehavior.
- ToimproveOrganizationalBehaviorbyhavingasoundknowledgeofculturaldifferences.

CourseOutcomes:

CO1: How to provide Flexible and scalable infrastructures as per user requirement
CO2: Understanding the components of AWS
CO3: Carrying out practical's through AWS.
CO4: The case studies will help us to understandmore of practice of cloud computing in the market.
CO5: Comparison of cost-wise solution to the problem and selecting the best solution for the problem suggested to the organization
CO6: Creating flexible and scalable infrastructure suitable to the organizational need.

Unit	CONTENT	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**CloudComputingFundamentals** : Definition of Cloud Computing , private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds	10	CO 1	Lecture with Ppts/practical's	Understand	Quiz End Term Internals:Short Answers
2	**Infrastructure &Networking** Introduction to Amazon Web Services AWS Global Infrastructure Introduction to Network Switches & Virtual Private Cloud VPC & Subnets Internet Gateways, VPC Peering & NAT Gateways IP Addressing in AWS Understanding AWS Security Groups Launching our first EC2 instance EC2 instance types & Pricing Models	10	CO 1	Lecture with Ppts/practical's		Case Study , Newspaper Article End Term: Applied Questions
3	**Storage** Introduction to Block & Object storage mechanism Introduction to Elastic Block Store - EBS EBS Snapshots EBS Volume Types Instance Store Volumes Introduction to Simple Storage Service (S3) Features of S3	10	CO 3	Lecture with Ppts/practical's	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Elastic Load Balancers** UnderstandingHigh Availability Configuration ELB Configuration **Elasticity** Auto Scaling **Identity & Access Management** Understanding the IAM Policies IAM User, IAM Policy and	10	CO1	Lecture with Ppts/practical's	Evaluate	Group Activity End Term Exam: Short case and situation based questions

	IAM Role					
5	**Relational Databases** Introduction to Relational Databases Creating our first database structure in MySQL Getting started with DynamoDB	05	CO2	Lecture with Ppts/practical's	Create	Case Presentation Activity End Term: Theory Applied
6	**DomainName System** Introduction to DNS Understanding DNS Records Introduction to Route53	05	CO4	Lecture with Ppts/practical's	Apply (Analyse)	Activity End Term: Theory Applied
7	**AWS Lambda and API** Getting started with AWS Lambda Introduction to API Understanding working of API Building our API with API Gateway	05		Lecture with Ppts/practical's/ CASE STUDIES	Apply (Analyse)	

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	RajkumarBuyya , JamesBroberg and Andrzej M.Goscinski	Cloud Computing: Principles and Paradigms.	2011	Wiley Publications
2	Bernard Golden	Amazon Web Services for Dummies	2007	Wiley

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.geeksforgeeks.org
2	http://www.thinkitsolutions.com
3	http://youtu.be/PW--7MJNY?si=uQ6ERO1QTi4JjSX

MOOCs:

ResourcesNo.	Websiteaddress
1	http://onlinecourse.nptel.ac.in
2	swayam.gov.in

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-(02)A**	**Statistical Programming using R**	
	Prepared By	**Dr. M. K. Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To teach the Beginners of R Programming of the a master level.
- A variety of topics will be covered that are important for Data science to prepare the students for real life prediction of data engineering.
- To impart knowledge of the concepts related to Probability and Application on data sets.
- It also gives the idea how data is managed in various environments with emphasis on Predictions measures as implemented in data sets.

CourseOutcomes:

CO1: Remember the definitions of concepts and their Implementation in R.
CO2: Understand the concept of data and statistical techniques for its Implementation.
CO3: Design different data behaviors and their Predictions.
CO4: Analyzing Data set & Studying Historical Data.
CO5: Convert the historical Data into Prediction Model using R

Unit No.	Contents	Session (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction of Probability** Concept, Types of Probability, Permutation and Combination concept, Addition and Multiplication Theorem, Condition Probability, Bayes's Theorem	8	CO 1 CO 2	Lecture with PPTs	Understand	Problems and its Solution
2	**Random Variable** Concept, Discrete and Continuous Random Variable, Probability density function, Mathematical Expectation and their Theorem	5	CO 1 CO 2	Problem Illustration	Apply (Analyze)	Problems and its Solution
3	**Data Distribution** Distribution, Types of Data distribution, Exponential	7	CO 3	Concept Explanation, Mathematical	Analyze	Problems and its Solution

	distribution, Binomial distribution, Normal distribution, Poisson distribution, Random number generation, Monte Carlo Simulation.			Problems, and its Solution		
4	**Testing of Hypothesis** Procedure of Testing Hypothesis, Standard Error and Sampling distribution, Estimation, Student's t-distribution, Chi-Square test and goodness of fit, F-test and analysis of variance. Factor analysis.	5	CO4	Concept Explanation, Mathematical Problems, and its Solution	Evaluate	Problems and its Solution
5	**Introduction to R programming language** Getting R, Managing R, Arithmetic and Matrix Operations, Introduction to Functions, Control Structures. Working with Objects and Data: Introduction to Objects, Manipulating Objects, Constructing Data Objects, types of Data items, Structure of Data items, Reading and Getting Data, Manipulating Data, Storing Data.	5	CO 5	Concept Explanation, Mathematical Problems, and its Solution	Create	Problems and its Solution
6	**Graphical Analysis using R** Basic Plotting, Manipulating the plotting window, Box Whisker Plots, Scatter Plots, Pair Plots, Pie Charts, Bar Charts.	5	CO 5	Software Demonstration and use of R Language	Evaluate	Problems and its Solution
7	**Advanced R** Statistical models in R, Correlation and regression analysis, Analysis of Variance (ANOVA), creating data for complex analysis, Summarizing data, and case studies.	10	CO 5	Software Demonstration and use of R Language	Evaluate	Problems and its Solution

Text Books	"Fundamentals of Statistics" Seven Edition By S.C.Gupta
Reference Books	1."Fundamentals of Statistics" Seven Edition By S.C.Gupta 2.“R Programming Fundamentals by KaelenMedeiras 3.“ Reinforcement Learning e-book. 4. Learning R Programming Guide on line **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(02)B**	**Introduction to Data Science**	
	Prepared By	**Dr. M. K. Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To teach the Beginners of Data analysis through R /Python Programming of the a master level.
- A variety of topics will be covered that are important for Data science in order to prepare the students for real live Project Analysis
- To impart knowledge of the concepts related to Machine Learning and implement and variety Application on data sets.
- It also gives the idea how data is managed in various environments with emphasis on Analysis measures as implemented.

CourseOutcomes:

CO1	Remember the definitions of concepts and their Programming skills.
CO2	Understand the fundamentals of Data Science, methods, techniques, and its implementation
CO3	Design different Model, test for its validity, and apply to different domain area.
CO4	Analysing Data set and Comparing different Model.
CO5	Convert the analysis in Modern approaches.
CO6	Write R/Python coding for Analysis

Unit No.	Contents	Session (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Association Rule** Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Association Rules, the Apriori Algorithm Classification and Prediction	5	CO 1 CO 2	Lecture with PPTs	Understand	Problems and its Solution
2	**Classification** Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier	5	CO 2 CO 3	Problem Illustration	Apply (Analyze)	Problems and its Solution

	Performance, Holdout Method and Random Sub sampling					
3	**Prediction** Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor. Clustering : Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering	5	CO 3 CO4	Concept Explanation, Mathematical Problems, and its Solution	Analyze	Problems and its Solution
4	**Linear Regression** Prediction using Linear Regression, Gradient Descent, Linear Regression with one variable, Linear Regression with multiple variables, Polynomial Regression, Feature Scaling/Selection	5	CO 3 CO 4	Concept Explanation, Mathematical Problems, and its Solution	Evaluate	Problems and its Solution
5	**Logistic Regression** Classification using Logistic Regression, Logistic Regression vs. Linear Regression, Logistic Regression with one variable and with multiple variables	5	CO 3 CO 4	Concept Explanation, Mathematical Problems, and its Solution	Create	Problems and its Solution
6	**Deep Learning** History, Scope and specification, why deep learning now, building block of neural network, neural networks, Deep learning hardware. Backward and forward neural networks, XOR model, cost function estimation (maximum likelihood), units, activation functions, layers, , normalization, hyper-parameter tuning, Convolution neural networks, architecture	10	CO 5 CO 6	Software Demonstration and use of R Language	Evaluate	Problems and its Solution

7	**Case study** Iris Data set ,Loan Data set, Titanic survival Data set ,Share Market Data set, Covide -19 Data set etc	10	CO 5 CO 6	Software Demonstration and use of R Language	Evaluate	Problems and its Solution

Text Books	**An Introduction to Machine Learning Springer by GopinathRebala**
Reference Books	1. Fundamentals of Statistics" Seventh Edition By S.C.Gupta **2.An Introduction to Machine Learning Springer byGopinathRebala** **3.Deep Learning MIT Press by John D.Kelleher.** **Suggested MOOC :**Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com, www.coursera.com

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-(03)A**	**Linux Desktop Environment, Shell Programming and System Administration**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To Learn Knowledge of Linux operating system .
- To Learn and understand Linux Architecture and Shell Commands
- To Write shell scripts and evaluate them
- To Create small applications for smart home/city using Arduino

CourseOutcomes:

CO1. Understand the basic concepts and philosophy of the Linux operating system.
CO2. Gain proficiency in using various applications of the open-source office suite, including word processing, spreadsheet management, presentation creation, and desktop database usage.
CO3. Acquire a comprehensive understanding of shell scripting using bash and other shell environments.
CO4. Explore routine activities in system administration and utilize shell commands and administrative tools for system management.
CO5. Learn to manage user accounts, provide user support, and automate system tasks such as system initialization, startup, shutdown, and task scheduling.

Unit	Contents	Sessions (Hrs)	Cos	Teaching Methodology	Cognition Level	Evaluation Tool
1	**Linux Installation** **Using Shell Interface:** ▪ Introduction to Linux ▪ Internal and external commands ▪ General purpose utilities ▪ Navigating the file system ▪ Handling ordinary files **Using GUI Environments:** ▪ GNOME desktop environment KDE desktop environment	08	CO1	Lecture with Ppts And demo for installation of Linux	Understand	Steps of Installation with Presentations Case based Questions/Applied Questions
2	**Using open source office suite** ▪ Word processor application ▪ Spreadsheet application ▪ Presentation application ▪ Desktop database application **Using the Internet** ▪ World wide web ▪ FTP ▪ Telnet	08	CO1 CO2	Lecture with Ppts	Understand And Apply	Presentations

	Using Multimedia ▪ Graphics ▪ AudioVideo					
3	**Introduction to shell** ▪ Introduction to 'bash' shell ▪ Redirection ▪ Pipes ▪ Tees ▪ Command substitution ▪ Introduction to other shells: Korn shell, C Shell etc. **Shell environment** ▪ Shell variables ▪ Handling the command line arguments ▪ Login scripts ▪ Terminal characteristics ▪ Aliases **Text editors** 'vi' editor , 'emacs' editor	08	CO3	Lecture with Ppts	Comprehensi ve knowledge of Linux	Class test and presentation
4	**Shell commands** ▪ General purpose utilities ▪ File management ▪ Process management ▪ Communication management **Regular expressions** ▪ Pattern matching ▪ Wild cards ▪ Regular expressions ▪ Utilities: grep, egrep, fgrep etc. **Filters** ▪ Introduction to filters Utilities: pr, head, tail, cut, paste, sort, uniq, nl, tr etc.	07	CO4	Lecture with Ppts	Learn Linux Commands	Class test and presentation
5	**Shell scripting** ▪ Introduction to shell scripting ▪ Programming constructs ▪ Mathematical operators ▪ Logical operators ▪ String manipulation ▪ Interactive scripts Handling command line arguments	06	CO4	Lecture with Ppts	Comprehensi ve knowledge of Linux Shell Scripts	Mid Term presentation
6	**Understanding system adminis.** ▪ Introduction to the routine activities in system administration ▪ Shell commands for system administration ▪ Administrative tools Managing file systems and disk space	06	CO1 CO2	Lecture with Ppts	Underrstandi ng and Learning	presentation

7	**Setting up and supporting users** ▪ Managing user accounts ▪ Providing support to the users **Automating system tasks:** ▪ Aut System initialization ▪ System startup and shutdown ▪ Scheduling system tasks omating system tasks: **Backing up and restoring files:** ▪ Backup and restore strategy ▪ Backup and restore tools **Computer security issues:** ▪ Password protection FirewallsImplement one small project	08	**CO5**	Lecture with Ppts	Learning How to setup Linux Environments	presentation

Text Books:

1. Red Hat Linux Bible: Fedora and Enterprise Edition – by Christopher Negus
2. How Linux Works 3E Paperback – 19 April 2021 – by Brian Ward)

Reference Books

1. UNIX Concepts and Applications – by Sumitabha Das
2. The Linux Programming Interface Hardcover – 1 October 2010 – by Michael Kerrisk (Author)

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.guru99.com/unix-linux-tutorial.html
2	https://www.geeksforgeeks.org/linux-tutorial/
3	https://www.edx.org/learn/linux
4	https://training.linuxfoundation.org/resources/free-courses/
5	https://ubuntu.com/tutorials/command-line-for-beginners#1-overview

MOOCs:

ResourcesNo.	Websiteaddress
1	NTPL
2	Swayam

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(03)B**	**Linux Internals and Network Administration**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To Learn Knowledge of Linux operating system .
- Remembering Linux Internal and Network Management commands
- Creating Proxy, server, File server, web server
- Analyzing inter process communication
- Use of Linux administration for creation of server and management

CourseOutcomes:

CO1. Understand the fundamentals of networking, including the OSI model and IP addressing (IPv4 and IPv6).
CO2. Configure network file sharing and resource sharing across Linux environments using NFS. And Setup and manage a YUM server for package management, including local YUM, FTP YUM, HTTP YUM, and configuring repositories like EPEL, REMI, and RPMForge.
CO3. Configure and manage a web server using Apache, including setting up the main site and multiple sites using IP-based, port-based, and name-based configurations.
CO4. Understand the booting process of Linux and the initialization process (init process or run levels).
CO5. Explore inter-process communication (IPC) mechanisms such as pipes, FIFO, and shared memory, along with their advantages and disadvantages and Implement synchronization mechanisms such as murex and POSIX semaphores for thread and process management.

Unit	**C**	**Sessions (Hrs)**	**COs**	**Teaching Methodology**	**Cognition Level**	**Evaluation Tool**
1	Setup And Manage a Local Area Network (8 Lectures) Basic Networking, Introduction to networking, OSI Model,IP addressing (IPV4, IPV6) & LAN establishment with Linux , Configuring internet in Linux through broadband, dial-up, data card & through mobile (gprs). Setup And Manage Proxy Server : Basics of proxy services, Configuring proxy services, Creating ACL's for controlling access to internet, SQUID: Proxy server setup, Blocking Websites, content filtering, Bandwidth Management	08	CO1	Lecture with Ppts And demo for installation of Proxy Server	Understand	Steps of Installation with Presentations Case based Questions/Applied Questions
2	Setup And Manage FILE Server (8 Lectures) NFS: network file sharing & resource	08	CO1 CO2	Lecture with Ppts	Understand And Apply to	Presentations

	sharing across Linux environment. YUM server: Setting up local YUM, FTP YUM, HTTP YUM, EPEL, REMI &RPMForge like YUM configuration, DHCP:Dynamic Host Configuration Protocol setting up, Allocating IP, Subnet mask, default gateway and hostname, communication with DNS and other protocols. ▪ Setup And Manage FTP Server				Setup YUM Server	
3	Setup And Manage Web Server (8 Lectures) Basics of Web Services, Introduction to Apache, Configuring Apache for main site, Configuring Apache for multiple sites using IP-based, port based and name-based, Web Server: Apache installation, configuring dedicated server, shared server, user based authentication, load balancing and apache tuning. NIS, LDAP: (user's liberty to sit into remote machine) MAIL Server: knowing MUA,MTA& MDA, setting up and configuring POSTFIX,PO3s v/sIMAPs, Squirrel mail, accessing via Outlook, Thunderbird and evolution. Multi/virtual domain management, email security. Postfix Administration.	08	CO2 CO3	Lecture with Ppts	Comprehensive knowledge of Linux Web Server	Class test and presentation
4	Setup And Manage boot Server (5 Lectures) What is booting and boot process of Linux?,Init Process or Run levels Setup And Manage DNS Server : Basics of Internet, Basics of DNS and BIND 9, Configuring DNS primary server, DNS:master DNS, slave DNS with forward & reverse zone, one DNS resolving multiple domain, dynamic DNS etc	07	CO3 CO4	Lecture with Ppts	Learn Mastrer Slave Booting Up Process	Class test and presentation
5	(6 Lectures) Architecture of Linux, User and Kernel Space, Introduction to System Calls, System Calls in Detail, trace – Tracing system calls. Process management Introduction to Process and process attributes, process vs. Program, Process States, Creating Process, Process termination, process commands Special	06	CO4	Lecture with Ppts	Comprehensive knowledge of Linux Architecture	Mid Term presentation

	case of processes. Inter Process Communication Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC					
6	Working with Signals and Threads (6 Lectures) Thread and Process Synchronization Threads and resources management, Race condition in multi-threaded applications,writing thread safe code,Mutex, POSIX Semaphores, Usage of Binary semaphores and Mutex Race condition in multi-process applications, Limitations of shared memory, Semaphore Implementation	06	CO1 CO2	Lecture with Ppts	Underrstanding and Learning Thread and Synchronization	presentation
7	Linux Networking (8 Lectures) OSI and TCP/IP models, Addressing in TCP/IP, IPv4 and IPv6 differences, TCP three-way handshake, Network packet analysis in Linux, Networking commands in Linux, Using socket API to implement client server communication, Working with TCP and UDP sockets, Synchronous I/O	08	CO5	Lecture with Ppts	Learning How TCP/IP working	presentation

Text Books

1. Linux Administration : A Beginner's Guide, Shah, TMH
2.LINUX: The Complete Reference, Petersen, TMH
3.LINUX Network Administrator's Guide, Kirch,SPD/O'REILLY

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.guru99.com/unix-linux-tutorial.html
2	https://www.geeksforgeeks.org/linux-tutorial/
3	https://www.edx.org/learn/linux
4	https://training.linuxfoundation.org/resources/free-courses/
5	https://ubuntu.com/tutorials/command-line-for-beginners#1-overview

MOOCs:

ResourcesNo.	Websiteaddress
1	NTPL
2	Swayam

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-(04)A**	Perl Scripting	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

To introduce basic concepts of Perl Programming and write, modify, and run simple Perl scripts and study working with files and using perl as an object oriented language

CourseOutcomes:

CO1: Using some basic concepts of Perl scripting terminology for development of applications for organization.
CO2: By remembering students will understand concepts of perl language and how to develop and implement various types of programs as per need of organization
CO3: Students will Have thorough knowledge about programming of Perl and object oriented concepts also using perl.
CO4 : Design and create ir own applications using procedures, functions, file handling & OOP objects To install HTTP server and to design and execute perl programs through CGI

Unit	Contents	**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Perl ─ Introduction** What is Perl? Perl features , Perl ─ Syntax Overview, Perl ─ Data Types , Numeric Literals String Literals , Perl ─ Variables , Creating Variables, Perl─ Scalars, Scalar Operations ,Perl ─ Arrays Perl ─ Hashes	4	CO 1	Lecture with Ppts	Understand	Short Answers
2	**Control Flow and Looping Statement** if statement , if else statement, if elsif else statement, unless statement, switch statement, ? : Operator **Perl ─ Loops :** while loop , until loop, for loop, For each loop do	5	CO 2	Lecture with Ppts	Apply	Short Answers/ Programs

	while loop nested loops, next statement, last statement, continue statement, redo statement, go to statement, Infinite Loop					
3	**Perl ─ Operators** What is an Operator? Perl Arithmetic Operators, Perl Equality Operators, Perl Assignment Operators, Perl Bitwise Operators, Perl Logical Operators, Quote-like Operators, Perl ─ Date and Time, GMT Time Format, Date & Time, Epoch time, POSIX Function strftime()	5	CO 3	Lecture with Ppts	Understand	Short Answers/ Programs
4	**Perl ─ Subroutines** Define and Call a Subroutine, Passing Arguments to a Subroutine, Passing Lists to Subroutines, Passing Hashes to Subroutines, Returning Value from a Subroutine, Private Variables in a Subroutine, Temporary Values via local(), State Variables via state() Subroutine, Call Context **Perl ─ References :** Create References Dereferencing Circular References, References to Functions Perl ─ Formats Define a Format Using Format, Define a Report Header Number of Lines on a Page, Define a Report	8	CO 1	Lecture with Ppts	Apply	Short Answers

	Footer , String and Mamatical Functions					
5	**Perl – File I/O** Opening and Closing Files, Open Function, Sysopen Function, Close Function, Operator getc Function, read Function, print Function, Copying Files Renaming a file, Deleting an Existing File Positioning inside a File **Perl – Directories :**Display all Files, Create new Directory, Remove a directory, Change a Directory	3	CO 1	Lecture with Ppts	Understand	Short Answers
6	**Perl – Regular Expressions** Pattern Matching, Match Operator Match Operator Modifiers Matching Only Once Regular Expression Variables. Substitution Operator Substitution Operator Modifiers. Translation Operator Translation Operator Modifiers More Complex Regular Expressions Matching Boundaries Selecting Alternatives Grouping Matching. \G Assertion Regular-expression Examples	8	CO 4	Lecture with Ppts	Creating	Programs
7	**Introduction to Object Oriented Programming in Perl** Object Basics, Defining a Class Creating and Using Objects, Defining Methods, Inheritance Method Overriding , Default Auto loading, Destructors and Garbage Collection,	7	CO 4	Lecture with Ppts	Creating	Long Answers/ Programs

	Object Oriented Perl Example					

References (Books, Websites etc.):

1.Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant, Programming Perl, O'Reily, 3rd Edition, 2010.

2. Scott Guelich, CGI Programming with Perl, O'Reily, et al., SPD publication, 2nd Edition, 2008.

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/perl/index.htm
2	https://www.javatpoint.com/Perl-tutorial

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL
2	UDEMY

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(04)B**	**RUBY**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

Main objective of this paper is to learn, object-oriented programming with Ruby, Rails fundamentals and how to create basic online applications. How to work with HTML controls, use models in Rails applications, and work with sessions. Details on working with databases and creating, editing and deleting database records, Methods for handling cookies and filters and for caching pages

CourseOutcomes:

CO1: understand the syntax and semantics of the Ruby language and their similarity and differences from Java
CO2: understand how to develop and implement various types of programs in the Ruby language
CO3: understand various forms of data representation and structures supported by the Ruby language
CO4 :understand the appropriate applications of the Ruby language

Unit	Contents	**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introductionto Ruby** Creatingafirstwebapplication,gettingstartedwithRuby,Checkingrubydocumentation,workingwithnumbersinruby,workingwithstringsinruby.	4	CO 1	Lecture with Ppts	Understand	Short Answers
2	**VariablesandConstantsinRuby** Storing data in variables, creating constants, interpolating variables in Double-Quoted strings, readingtextoncommandline,creatingsymbolsinruby,workingwithoperators,Handlingoperatorprecedence,workingwithArrays,usingTwoArrayIndices,workingwithHashes,workingwith ranges.	5	CO 2	Lecture with Ppts	Apply	Short Answers/ Programs
3	**ConditionalLoops,MethodsandBlocks** IfStatement,Usingcasestatement,usingloops,creatingand calling method,makinguseof Scope, working with Blocks	5	CO 3	Lecture with Ppts	Understand	Short Answers/ Programs
4	**Classes** creatingaclass,creatinganobject	8	CO 1	Lecture with Ppts	Apply	Short Answers

	DataEncapsulation,DataAbstraction,Polymorphism, Inheritance					
5	**Objects** UnderstandingRuby'sobjectAccess,overridingmethod,creatingclassvariables,creatingclass methods,creatingModules	3	CO 1	Lecture with Ppts	Understand	Short Answers
6	**Rails** PuttingRubytoRails,introducingModel ViewControllerArchitecture,givingviewsomethingto do, mixing ruby code and HTML insideview, passing data from an action to a view, escaping sensitive text, adding a second action.	8	CO 4	Lecture with Ppts	Creating	Programs
7	**BuildingSimpleRailsApplications** Accessingdatauserprovides,usingrailsshortcutsforHTMLcontrols,workingwith models,tying controls to models, initializing data in controls, storing data in sessions	7	CO 4	Lecture with Ppts	Creating	Long Answers/ Programs

References (Books, Websites etc.):

- Programming Ruby: Pragmatic Programmers' Guide, Second Edition
- Hal Fulton's **Ruby Way: The Solutions and Techniques in Ruby Programming**
- Agile Web Development with Rails, Third Edition
- www.webtechlearning.com

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/Ruby/index.htm
2	https://www.javatpoint.com/Ruby-tutorial
3	https://www.w3schools.com/Ruby/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL
2	UDEMY

Programme: MCACBCS– Revised Syllabusw.e.f.-Year 2022–2023			
Semester	**Course Code**	**CourseTitle**	
III	**ELE-(05)A**	**JavaScript Programming**	
	Prepared By	**Dr. Ayesha Mujawar**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSE	**3**	IE	100

CourseObjectives:

Objectives:

- Tolearn JavaScript as a scripting language.
- Working for dynamic web pages with validation using Java Script objects
- To learn about JQuery, AJAX and JSON.

CourseOutcomes:

Aftercompletingthecoursethestudentsshallbeableto

CO1: To understand the basics of JavaScript

CO2: To understand various programming constructs and Objects in JavaScript

CO3: To understand how to validate form data using JavaScript.

CO4: To develop interactive web pages for real world application scenarios using JavaScript/JQuery, AJAX and JSON.

Unit	Sub Unit	Sessions	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Javascript** • JavaScript Overview , JavaScript Programming Basics • Variables and Operators : Variables and Data Types , Operators , Array	5	CO1	Lecture	Understand	Quiz Short Answers
2	**Control Statements** •Controlling the Flow: JavaScript Control statements • Functions : Parametersand working • The Window Object : The Window Object, Dialog Boxes, Window function	5	CO2	Lectures with PPTs	Understand	Quiz Short Answers
3	**The Document Object** The Document Object, Writing toDocuments, Document related functions • Forms and Forms-based Data :	4	CO2	Lectures with PPTs	Understand	Quiz Short Answers

	TheForm Object , Working with Form Elements and Their Properties ,Event related with form					
4	**Form Validation** • A Process, Testing Data • Preparing Data for Validation andReporting Results, Validating Non-text Form.	4	CO3	Lectures with PPTs	Understand	Quiz Short Answers
5	**Frames** • HTML Frames Review, Scripting ForFrames • The String and RegExpObjects: The String Object, Properties and methods of String Object, Using String Object Methods to Correct Data Entry Errors, The RegExp Object • Dates and Math: The Date Object, Properties and method of Date Object, The Math Object , Properties and methods of Math Object	6	CO2	Lectures with PPTs	Understand	Quiz Short Answers
6	**AJAX** • **Animation**: Frequently used Animation function, Manual and Automated animation. • **AJAX**: Introduction to AJAX, Interacting with the Web Server using XMLHttpRequest Object, Need of Web server	8	CO4	Lectures with PPTs	Create	Quiz Short Answers
7	**JS Frameworks & Libraries** • Need of JSON , RESTful API WithJSON • jQuery, Intro ,Effects and animationsDOM/HTMLUpdates, jQuery and Ajax	8	CO4	Lectures with PPTs	Create	Quiz Short Answers

ReferenceBooks:

Sr.No.	Nameofthe Author	TitleoftheBook	Year Edition	Publisher Company
1	Jon Duckett	JavaScript and JQuery: Interactive Front-End Web Development	2017	CreateSpace Independent Publishing Platform
2	David Flanagan	JavaScript: The Definitive Guide	2020	O'Reilly Media, Inc.
3	IvelinDemirov	Learn JavaScript VISUALLY	2014	CreateSpace Independent Publishing Platform

Online Resources:

OnlineResourcesNo.	Websiteaddress
1	https://www.tutorialspoint.com/javascript
2	https://www.javatpoint.com/javascript-tutorial
3	https://www.w3schools.in/js

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL/Swayam
2	www.edx.com
3	www.coursera.com

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(05)B**	**Android**	
	Prepared By	**Dr. SatyawanHembade**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To understand architecture of mobile application using Android
- To get acquainted with life cycle of android application and its component
- TodevelopproficiencyincreatingMobilebasedapplicationsusingtheJavaProgrammingLanguage.
- Todevelopapplicationusingandroid with data handling(databaseaccess)

CourseOutcomes:

At the end of this course, student should be able to understand

CO1: State features of Android, components of android architecture and android application.

CO2: Describe components of android application along with life cycle of activity, intent, fragment etc.

CO3: Apply android knowledge to design and develop mobile applications

CO4: Analyze the use of Intent, Fragment, content providers and sensors.

CO5: Evaluate use of various component of android application.

CO6: Create and publish Android application using various component and database.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**IntroductiontoAndroid** Android OS, evolution and advantages of android, Dalvik Virtual Machine, Features of Android, API Level Introduction, Linux Kernel, Libraries, Android Libraries, Android Application Framework, Introduction to Application components	**5**	CO1, CO2	Lecture with PPT	Understand	Quiz

2	**Android Studio** Downloading and installing Android Studio, Android Studio Overview, Creating a first project (HelloWorld), Understanding Project internals and configuration files. Creating and Launching emulator(Android Virtual Device), Editing emulator settings, Running first android application on emulator	**5**	CO2	Lecture with PPT, Hands On Demo	Understand	Quiz
3	**Working with Activities and Layouts** Android Activities Introduction, Life Cycle, Working with Activities, handling events, making use of resource files, concept of intents and using it to launch new activities. UI Layouts, Types of Layout, Configuration of Layouts, View Identification, UI Controls, Event Handling, understanding and using fragments, Making use of adapters	**8**	CO 3	Lecture with PPT, Hands On Demo	Analyze	Class Test, Lab assignment, Mid Term Exam
4	**ContentProviders**: Working with Shared Preferences, storing and retrieving shared key-value pairs. tore data using SQLite database, Content Providers, Content Resolver, Loader	**6**	CO3, CO6	Lecture with PPT, Hands On Demo	Evaluate, Create	Lab Assignment

5	**Intents and Intent Filters** Understanding the Intents, Android Intent Messaging via Intent Objects, Intent Resolution, Intent Filters, Explicit Intents, Implicit Intents, Working with Intents, Using Intents with Activities,AndroidServices,UsingIntentswithBroadcastReceivers	**7**	CO2, CO4	Lecture with PPT, Hands On Demo	Evaluate, analyze, Create	Lab Assignemnt
6	**Sensor, Location and Maps** Sensor Basic, Motion and Position Sensors, Using Orientation and Accelerometer sensors Using Location Based Services, Finding current location and listening for changes in location , Proximity alerts, Working with Google Maps, Showing Google map in an Activity, MapOverlays, Itemized overlays,Geocoder, Displaying route on map	**8**	CO5	Lecture with PPT, Hands On Demo	Evaluate, analyze, Create	Class test, End Term Exam, lab Assignment
7	**Performance Improvement and Publishing** Performance Parameters, Profiling Tools, Rendering and Layout, Garbage Collection and Memory Leaks, Best Practices. Preparing for publishing ,Signing and preparing the graphics , publishing to the Android Market	**6**	CO6	Lecture with PPT, Hands On Demo	Evaluate, analyze, Create	End Term Exam: Mini Project

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Barry A.Burd	AndroidApplicationDevelopment All-in-OneForDummies	August 2015	For Dummies
2	Bryan Sills, Brian Gardner, et al	AndroidProgramming:TheBigNerdRanchGuide Programming Android	5th edition	Addison-Wesley Professional
3	J F DiMarzio	Beginning Android Programming with Android Studio	4th Edition 2016	Wiley India Pvt Ltd
4	Dawn Griffiths and David Griffiths	Head First Android Development: A Brain-Friendly Guide	2nd Edition, 2017	Shroff/O'Reilly

MOOCs:

ResourcesNo.	Websiteaddress
1	https://alison.com/
2	https://nptel.ac.in/courses/106/106/106106147/

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**CourseCode**	**Course Title**	
III	**ELE-06 (A)**	**C# Programming and Applications**	
	Prepared By	**Mr.Abhijit A. Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

Tomakestudents to:

- To acquire knowledge regarding C# Programming features and working with major components
- To learn and apply Object Oriented Concepts in C# Programming to develop applications.
- Tounderstand concept of ADO.Net and develop database applications.

CourseOutcomes:

Aftercompletingthecoursethestudents shall beable to

CO1: Use basic concepts of object-oriented programming, event driven programming and database application programming in C# can be understood and remembered.

CO2:Remembering basic concepts students can understand how to work with programming in C#. Students need to understand programming structures of OOP in C#, methods and properties of various controls of windows forms application along with database objects and their methods.

CO3: Have detailed knowledge of Abstraction, Inheritance, Polymorphism, Encapsulation, Exceptio Handling, Windows forms applications and database applications.

CO4: To use proper methods of C# to solve object oriented problems.

CO5: Apply the concepts of C# programming to create console based and windows based applications.

Unit	Contents	Sessions (Hrs.)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to C#:** Programming Features of C#, Keywords in C#, Namespaces, Data Types, Variables, Operators, Type Conversions, The '?:' Operator, Control Statements.Methods, Passing Method Parameters, Method Overloading, Array, Array List class, String Methods, for each loop.	**7**	CO1	Lecture with PPTs, Quiz	Rememberi ng	End Term Internals Assignments Quiz
2	**Classes and Objects:**	**7**	CO2	Lecture with	Understandi	End Term

	Basic Principles of OOP, Define a Class, Member Access Modifiers, Constructors, Types of Constructors (Default Constructor, Overloaded Constructor, Static Constructor, Private Constructor and Copy Constructor), Destructors, 'this' Reference, Constant Members, Properties, Auto Implemented Properties, Object Initializer, Collection Initializer, Anonymous Types, Extension Methods, Partial Class, Partial Methods, Indexers.			PPTs	ng	Internals Assignments Quiz
3	**Inheritance and Polymorphism:** Define Inheritance, Types of Inheritance, Method Overriding, Abstract Class, Abstract Methods, Sealed Class and Methods, Define Polymorphism, Static Polymorphism: Function Overloading Operator Overloading, Overloadable and Nonoverloadable Operators, Dynamic Polymorphism, Defining Interface, Extending interface, Interface and Inheritance, Explicit Interface	**8**	CO3	Lecture with PPTs	Applying	End Term Internals Assignments Quiz
4	**Errors and Exception Handling:** Types of Errors, Exceptions, Syntax for Exceptions, Handling Code, Multiple catch Statements, finally Statement, Nested try Block, Throwing Our Own Exception.	**7**	CO4	Lectures with PPTs	Evaluating	End Term Internals Assignments Quiz
5	**Working with Windows Form Controls:** Properties, Events and Examples of:Button, Label, LinkLabel, TextBox, RichTextBox, ListBox, ListView, ComboBox, RadioButton, CheckBox, CheckedListBox, DateTimePicker, PictureBox, Timer, ProgressBar, TrackBar, HScrollBar, VScrollBar.	**7**	CO4	Lecture With PPTs, Demonstration	Evaluating	End Term Internals Assignments Quiz

6	**Menus, MDI and Containers:** ContextMenuStrip, MenuStrip, StatusStrip, ToolStrip, SDI and MDI, Visual Inheritance, GroupBox, Panel, TreeView, SplitContainer, TabControl Example.	**7**	CO5	Lectures with PPTs	Creating	End Term Internals Assignments Quiz
7	**Data Access and Data Bindings**: ADO.NET Overview, .NET Data Providers, ADO.Net Objects, Connections, Commands, Data Adapters, Data Readers , Data Sets , Data Tables , Data Views , Data Bindings, Reports.	**7**	CO5	Lecture With PPTs, Demonstratio n	Creating	End Term Internals Assignments Quiz

Reference Books:

Sr.No.	Name of theAuthor	Titleof the Book	Publisher Company
1	Schildt, Herbert	C#: The Complete Reference	McGraw-Hill/ Osborne Media
2	Simon Robinson	Professional C # Programming	Wrox publication
3	E. Balaguruswamy	Programming in C# -A Primer	Tata McGraw-Hill

OnlineResources:

OnlineResourcesNo.	Websiteaddress
1	https://www.studytonight.com/post/introduction-to-csharp
2	https://www.tutorialspoint.com/csharp/index.htm
3	https://www.w3schools.com/cs/index.php
4	https://www.youtube.com/watch?v=M5ugY7fWydE

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL/Swayam
2	www.edx.com
3	www.coursera.com

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year 2022–2023			
Semester	**Course Code**	**CourseTitle**	
IV	**ELE-(06)B**	**ASP.Net with MVC**	
	Prepared By	**Mr.Alok.S.Shah**	
Type ofCourse	**Credits**	**Evaluation**	**Marks**
DSE	**3**	IE	100

CourseObjectives:

Objectives:

- To introduce ASP.Net framework .
- To understand Event driven programming in ASPNET.
- To understand working with web forms and database.
- To introduce AJAX and MVC Architecture.

CourseOutcomes:

Aftercompletingthecoursethestudentsshallbeableto

CO1-Students will be able to apply the concepts of Object oriented programming and C# to make console and windows applications.

CO2. Students will be able to prepare good UI with the help of various C# controls, themes and master page.

CO3. Students will be able to design fully functional web application using the concepts of ADO.Net, various server controls and state management.

CO4. Students will be able to use advanced concepts related to AJAX and MVC in project development.

Unit	Sub Unit	Sessions	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to ASP.Net**: Introduction to ASP.Net, ASP.Net Architecture, ASP.Net Page Life Cycle, Page Life Cycle Events, ASP.Net Directives., FileUpload Control, Calendar Control, AdRotator Control, MultiView Control, and Wizard Control Examples, Validation Controls, Menu, SiteMapPath, TreeView Control.	7	CO 1	Lecture with Ppts Quiz	Understand and apply	Quiz End Term Internals:Short Answers and Practical Test

2	**Master Pages, CSS, and JavaScrip** Working With Master Pages, Nested Master Pages, CSS Overview, Adding Style Sheets into, Web Pages, Editing Styles, Applying Styles to Master Pages, Applying Styles to Web Page, JavaScript Overview, Adding JavaScript files into ASP.Net, Editing JavaScript Files, Applying JavaScripts to Master Pages, Applying JavaScripts to WebPage.	6	CO 2	Lecture with Ppts	Understand and Apply	End Term: Applied Questions and Practical Test
3	**State Management**: View State, Hidden Field, Session State, Application State, QueryString HttpContext, Cookies, Caching, Types of Caching.	5	CO 2	Lecture with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
4	**Data Access in ASP.Ne**t: Data Source Controls, DataList, DataPager, GridView, DetailsView, FormView, Object Data Sources, ListView, DataPager, Repeater.	8	CO3	Lectures with PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
5	**ASP. Net Web Parts:** Introduction, Advantages of Web Parts, WebPartsManager, CatalogPart, PageCatalogPart, EditorPart, WebPartZone,, EditorZone, CatalogZone Controls.	4	CO4	Lecture With PPTs	Understand and Apply	End Term: Applied Questions and Practical Test
6	**Ajax Controls:** AJAX control toolkit, Building a ASP.NET Page with AjaxScriptManager Control, UpdatePanel Control, UpdateProgress Control, Timer Control	4	CO4	Lectures with PPTs	Understand and Apply	Activity End Term: Theory Applied
7	**Working with MVC:** Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, MVC Components, MVC Application Folders, Configuration files- global.asax, packages.config,	6	CO4	Lectures with PPTs	Understand and Apply	Activity End Term: Theory Applied

	web.config, Working with Views, Woking with Controls.					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Matthew MacDonald	ASP.Net: The Complete Reference		Tata McGraw Hill
2	Robinson et al	Professional ASP.Net (4/4.5) in C #		Wrox Press, 2002

Suggested MOOC

OnlineResourcesNo.	Websiteaddress
1	Coursera (www.coursera.org)
2	mymooc (www.my-mooc.com
3	Class Central (www.class-central.com)
4	edX (www.edx.org)
5	Mooc List (www.mooc-list.com)

Programme: MCACBCS– Revised Syllabusw.e.f.-Year 2022–2023			
Semester	**Course Code**	**CourseTitle**	
III	**ELE-(07)A**	**HTML 5.0**	
	Prepared By	**Dr. Ayesha Mujawar**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSE	**3**	IE	100

CourseObjectives:

Objectives:

- An overview of the HTML5 specification
- Practical knowledge to implement new HTML5 elements and attributes.
- To learn about web forms using HTML5

CourseOutcomes:

Aftercompletingthecoursethestudentsshallbeableto

CO1: To understand the basics of HTML and HTML5.
CO2: To understand features and elements of HTML5.
CO3: To understand and learn advanced tags in HTML5.
CO4: To develop web forms using HTML5 advanced features in websites.

Unit	Sub Unit	Sessions	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to HTML** MIME Types, Standards for the Internet, Evolution of HTML, Introduction to XHTML, Introduction to Working Group, W3C	7	CO1	Lecture	Understand	Quiz Short Answers
2	**Features of HTML5** Detection of HTML5 Support, Modernizer: An HTML5 Detection Library, Canvas, Canvas , Text, Video, Video Formats, Local Storage, Web Workers, Offline Web Applications, Geolocation, Input Types, Placeholder Text, Form Autofocus, Microdata	6	CO2	Lectures with PPTs	Understand	Quiz Short Answers
3	**Elements of HTML5** The Doctype, The Root Element, The <head> Element, New Semantic Elements in HTML5, Handlingof Unknown Elements by the Browsers, Headers,	7	CO2	Lectures with PPTs	Understand	Quiz Short Answers

	Articles, Dates and Times, Navigation, Footers					
4	**Drawing Surface** Introduction to Canvas, Simple Shapes, Canvas Coordinates, Paths, Text, Gradients, Images	7	CO3	Lectures with PPTs	Understand	Quiz Short Answers
5	**Video on the web** Video Containers, Video Codecs, Audio Codecs	6	CO3	Lectures with PPTs	Understand	Quiz Short Answers
6	**Geolocation and Local Storage for Web Applications** Geolocation API, Handling Errors, geo.js Library, Evolution of Local Storage, Introduction to HTML5 Storage	7	CO4	Lectures with PPTs	Create	Quiz Short Answers
7	**Web Forms and Offline Web Application** Introduction to Web Forms, Placeholder Text, Autofocus Field, e-Mail, Addresses, Web Addresses, Numbers as Spinboxes, Numbers as Sliders, Date Pickers, Search Boxes, Color Pickers, Introduction to Offline Web application, The CacheManifest	6	CO4	Lectures with PPTs	Create	Quiz Short Answers

ReferenceBooks:

Sr.No.	Nameofthe Author	TitleoftheBook	Year Edition	Publisher Company
1	BruceLawson, Remy Sharp	Introducing HTML 5.0	2011	New Riders; 2nd edition
2	Jeffrey Zeldman and Jeremy Keith	HTML 5 for Web designers	2016	A Book Apart; 2nd edition
3	Christopher Murphy, DivyaManian, and Richard Clark	BeginningHTML5 andCSS3	2012	APress; 1st ed. edition

Online Resources:

OnlineResources No.	Website address
1	https://www.tutorialspoint.com/html5
2	https://www.javatpoint.com/html5-tutorial
3	https://www.w3schools.in/html5/tutorials/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL/Swayam
2	www.edx.com
3	www.coursera.com

Program:MCACBCS– Revised Syllabusw.e.f.-Year 2022–2023			
Semester	**Course Code**	**CourseTitle**	
IV	**ELE- (07)B**	**AJAX PROGRAMMING**	
	Prepared By	**Mrs. VrushaliSalunkhe**	
Type of Course	**Credits**	**Evaluation**	**Marks**
DSE	**3**	IE	100

CourseObjectives:

Objectives:

- Tolearnweb architecture.
- Have knowledge about practical approach of AJAX programming.
- Design website using better tools using AJAX.

CourseOutcomes:

Aftercompletingthecoursethestudentsshallbeableto

CO1: To understand basic concepts & applications of AJAX programming.
CO2: To gain knowledge of web server to develop website using AJAX.
CO3: To select proper tools for website development using AJAX and understand security features of language.
CO4: To design and develop web applications or websites for various business applications.

Unit	Sub Unit	Sessions	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to AJAX** Introduction to WebArchitecture, • Traditional Web Communication Processes and Technologies • Introduction to AJAX	6	CO1	Lecture	Understand	Short Answers
2	**Interacting with the Web Server using XMLHttp Request Object** • Introduction to Interaction with Web Server • Create XMLHttpRequest Object • Interact with the Web Server	7	CO2	Lectures with PPTs	Understand	Quiz Short Answers
3	**Working with PHP and AJAX** • Introduction to PHP • Process Client Requests • Accessing Files Using PHP	6	CO3	Lectures with PPTs	Create & Apply	Assignment

4	**Manipulating XML Data** • Basics of XML • Create an XML Document Using DOM • Retrieve Data from XML	7	CO3	Lectures with PPTs	Apply	Test
5	**Working with XSLT and AJAX** • Basics of XSLT • Transform Responses Using XSLT	7	CO3	Lectures with PPTs	Create, Apply	Quiz Short Answers
6	**Working with JSON** • Introduction to JSON Format • Create Data in JSON Format • Implement JSON on the Server Side scripting • Dynamicmemoryallocation	6	CO3	Lectures with PPTs	Apply	Quiz Short Answers
7	**Using Frameworks in AJAX** • Understand AJAX Frameworks • Use Prototype and Script.aculo.us • Use jQuery **Applying Basic AJAX Techniques** • Download Images Using AJAX • Auto-Populate Select Boxes **Implementing Security and Accessibility in AJAX Applications** • Create Secure AJAX Applications • Create Accessible Rich Internet	6	CO4	Lectures with PPTs	Create	Quiz Short Answers

ReferenceBooks:

Sr.No.	Nameofthe Author	TitleoftheBook	Year Edition	Publisher Company
1	Anil Gaikwad, JyotiBirada	Basic Concepts of System Analysis	2019	Lambert Academic Publication
2	Brian Albers, Frank Salim, Peter Lubbers	Pro HTML 5.0 Programming	-	-
3	Anthony T. Holdener	Ajax: The Definitive Guide: Interactive Approach	2014	-
4	Kris Hadlock	Ajax for Web Developers	2012	Amazon Books
5	Thomas A Powell	Ajax : The Complete Reference	2013	Amazon Books

Online Resources:

OnlineResourcesNo.	Websiteaddress
1	www.edx.comwww.coursera.com
2	https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL/Swayam
2	www.edx.com
3	www.coursera.com

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
III	**ELE-08(A)**	**Recommender System**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

Course Objectives:

1. To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.
2. To provide a conductive environment for designing, implementing and testing various software applications through Software Development.
3. To keep the students and faculty abreast with the emerging technologies in the field of computer applications.
4. To bring professionalism amongst the students and promote holistic development.
5. To involve students in sustainable IT practices and community services.

Course Outcomes: (CO)

CO1: Using some basic concepts of software databases, development stages and software development also software engineering Information can be understood and remembered.

CO2: By remembering students the basing concepts students will understand the concepts of Recommender system, Internet and database concepts.

CO3: Students will Have thorough knowledge about practical approach in database design and design the recommender systems for business applications

CO4: To Measure the Information systems applications with respect to business benefits. Reduce the risk of decision making.

CO5: Ability to select proper method to use proper recommender system for business applications and make it useful for business functions.

CO6: Design and create own recommender system as per the requirements of the business and functions the business After going through this course a student should be able to understand :

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Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Basic Concepts:** Collaborative Recommendation: User Based Nearest Neighbor recommendation, Item Based Nearest Neighbor recommendation, model based and pre-processing based approaches. Recent practical approaches and systems.	08	CO 2	Lecture with PPts.	Understand	Presentation

	Content based Recommendation: content representation and content similarity, similarity based retrieval, other text classification methods, Knowledge Based Recommendation: Knowledge representation and reasoning, interacting with constraint based recommenders, interacting with case based recommenders,					
2	**Hybrid recommendation approaches:** Opportunities for hybridization, Monolithic hybridization design, parallelized hybridization design, pipelined hybridization design,	08	CO4	Lecture with Ppts	Apply (Analyse)	Machine Learning Algorithm Tool
3	**Evaluating recommender systems :** General properties of Evaluation research, popular evaluation designs, evaluation on historical datasets, alternate evaluation design	10	CO5	Lecture with PPTs Case Study	Evaluate	Performance Calculating
4	**Recent developments:** Attacks on collaborative recommender systems, Online consumer decision making	8	CO6	Lectures with PPTs	Understand	Decision Making Tools
5	**Recommender systems and the next-generation web** Recommendations in ubiquitous environments.	8	CO6		Create	Case Study
6	**Explanations in recommender systems** Explanations in constraint-based recommenders, explanation in case based recommenders, explanation in collaborative filtering recommenders.	08	CO1	Lectures with PPTs	Analysis	Knowledge
7	Case studies on Recommender	05	C03	Case Study	Create	Case Studies

	System for various Business applications					

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Charu C. Aggarwal	"Recommender Systems: The Textbook"	2016	Springer International Publishing Switzerland 2016
2	Kim Falk	**Practical Recommender Systems**	2019	Manning Publications

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.geeksforgeeks.org
2	http://www.thinkitsolutions.com
3	http://youtu.be/PW--7MJNY?si=uQ6ERO1QTi4JjSX

MOOCs:

ResourcesNo.	Websiteaddress
1	http://onlinecourse.nptel.ac.in
2	swayam.gov.in

Programme: MCA CBCS–Revised Syllabus w.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
IV	**ELE-08(B)**	**Knowledge Management**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

Course Objectives:

6. To build a strong foundation for students to become proficient in all academic concepts and technical skills necessary to become an IT Professional.
7. To provide a conductive environment for designing, implementing and testing various software applications through Software Development.
8. To keep the students and faculty abreast with the emerging technologies in the field of computer applications.
9. To bring professionalism amongst the students and promote holistic development.
10. To involve students in sustainable IT practices and community services.

Course Outcomes: (CO)

- **CO1:** Using some basic concepts of software development, information system and applications of databases c business problems the objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.
- **CO2**: By remembering students the basic concepts of Knowledge management students will understand the concepts of applications of knowledge management to the business problems.
- **CO3**: Students will Have thorough knowledge about practical approach in designing knowledge management systems for business functions and apply the various advanced tools of software development
- **CO4**: To Measure the knowledge management applications with respect to business benefits. Reduce the risk of decision making.
- **CO5**: Ability to select proper method to use proper knowledge management system for business applications a make it useful for business functions.
- **CO6** Design and create own knowledge management After going through this course a student Should be able to understand: Will be able to understand the concepts of Knowledge and knowledge management. Can be able to design and develop Knowledge management systems for Business applications. Implementation of KM to various areas of Interest in Business Organizations.

Unit	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction:** Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM,	08	CO 2	Lecture with PPts.	Understand	Presentation

	Organizational knowledge, Characteristics and Components of Organizational Knowledge					
2	**Drivers of knowledge Management** Pillars of knowledge Management, KM framework, Supply Chain of KM, Formulation of KMstrategy.	08	CO4	Lecture with Ppts	Apply (Analyse)	Knowledge Management Tool
3	**Technology and KM:** Technology components of KM – IT &KM , Ecommerce and KM	10	CO5	Lecture with PPTs Case Study	Evaluate	Technology Concepts
4	**Total Quality Management and KM:** TQM and KM , Bench marking and KM.	8	CO6	Lectures with PPTs	Understand	TQM tools
5	**Implementation of KM:** Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM	8	CO6		Create	Case Study
6	**KM and Organizational Restructuring:** The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation.	08	CO1	Lectures with PPTs	Analysis	Knowledge
7	**Case studies in Knowledge Management** Knowledge management in Health Care, Knowledge Management in Human Resource Management and other areas of Business Applications.	05	C03	Case Study	Create	Case Studies

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Anil Gaikwad , Rajesh Kanthe	Innovation Management: A Business Development Approach	Dec 2019	Lambert Academic Publication
2	Honey Cutt	Knowledge Management Strategies	2019	PHI, NewDelhi

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.geeksforgeeks.org
2	http://www.thinkitsolutions.com
3	http://youtu.be/PW--7MJNY?si=uQ6ERO1QTi4JjSX

MOOCs:

ResourcesNo.	Websiteaddress
1	http://onlinecourse.nptel.ac.in
2	swayam.gov.in

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-(09)A**	**IoT Architecture Sensors and Fundamentals with Hands-on lab**	
	Prepared By	**Mrs. UjwalaKawade**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- Introduce evolution of internet technology and need for IoT.
- Discuss on IoT reference layer and various protocols and software
- Train the students to build IoT systems using sensors, single board computers and open sourceIoT platforms.
  Make the students to apply IoT data for business solution in various domain in secured manner

CourseOutcomes:

CO1 : Students will be explored to understand the various enabling IoT concepts, application areas of IOT, Hands on Experience on Node Red with Raspberry Pi.
CO2 : Students will be explored to understand the various concepts of Cloud & Sensor Networks, able to understand the Data Mapping and Monitor and Analyze the data on Cloud, and Interconnection of the physical world and the cyber space.
CO3 : Identify the IoT networking components with respect to OSI layer.
CO4 : Build schematic for IoT solutions.
CO5 : Design and develop IoT based sensor systems.
CO6 : Evaluate the wireless technologies for IoT.

Unit		Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**IOT concepts:** • Technologies that led to evolution of IOT • IOT and SCADA • IOT and M2M • IOT and Big Data Relevance of IOT for the future	3	CO 1, CO 2	Lecture with Ppts	Understand	Quiz End Term Internals: Short Answers

	• IOT in everyday life • Internet of Everything • IOT and Individual Privacy. **Sensing, Actuation, Basics of Networking:** layered architecture, important protocols (MQTT, CoAP, REST, XMPP, AMQP)					
2	**IOT Standards** : Requirement of international standard (case study) IOT standards in practice. Operating platforms /systems **connectivity Technologies:** 802.15.4, Zigbee, 6LoWPANs, RFID, HART, Bluetooth, ZWAVE, ISA 100.11-A	3	CO 2	Lecture with Ppts	Understand	Short Answers
3	**Sensor Networks:** components of sensor networks, deriving data from sensor nodes, different types of sensor networks and behavior of node in a sesor network, target tracking, wireless multimedia sensor network,nanonetworks, relationship between coverage and connectivity, stationary wireless sensor networks, mobile wireless sensor networks, UAV Networks	3	CO 2, CO 3	Lecture with PPTs	Understand	Short Answers
4	**Machine-to-Machine Communications**: exchanging data between machines without human intervention, Low-end sensor nodes, mid-end sensor nodes, M2M ecosystem	3	CO5	Lectures with PPTs	Understand	Quiz and Short Answers
5	**Interoperability in IoT**, syntactic and semantic interoperability **Introduction to Arduino Programming**: Features of Arduino Arduino IDE Sketch Structure Arduino Function Libraries: Example : blink LED Operators, control statements,	3	CO6	Lectures with PPTs Lecture Case Activity	Understand	Short Answers

	arrays, string, random number, interrupts					
6	Integration of Sensors and Actuators with Arduino: Sensor interface with Arduino, DTH Sensor Library, Type of Motor Actuators, integration of Actuator with Arduino		CO1, CO 2	Lectures with PPTs Group Activity Video Cases	Understand	Short Answers
7	IOT Applications: Lighting as a service (case study) Intelligent Traffic systems (case study) Smart Parking (case study) Smart water management (case study) Implement one small project		CO 2, CO 6	Lectures with PPTs Group Activity Video Cases	Analyze, Create	Case Study

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle	"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",	1 st Edition - 2014.	Academic Press,
2	Peter Waher,	"Learning Internet of Things",		PACKT publishing
3	Bernd Scholz-Reiter, Florian Michahelles	Architecting the Internet of Things		

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

MOOCs:

ResourcesNo.	Websiteaddress
1	https://nptel.ac.in/courses/106/105/106105166/

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(09)B**	**Internet Of Things: Sensing And Actuator Devices and Smart city use case**	
	Prepared By	**Mrs. UjwalaKawade**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- Introduce evolution of internet technology and need for IoT.
- Discuss on IoT reference layer and various protocols and software
- Train the students to build IoT systems using sensors, single board computers and open sourceIoT platforms.
  Make the students to apply IoT data for business solution in various domain in secured manner

CourseOutcomes:

CO1 : Understand IoT architecture
CO2 : Program Embedded IoT devices
CO 3 : Use IoT protocol to upload sensor data and to control devices
CO4 : Build schematic for IoT solutions.
CO5 : Design and develop IoT based sensor systems.

Unit		**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**IoT: Components, Communication and Networking Introduction to Sensing and Networking**: Sensing & actuation, Wireless Senor network, Senor nodes, Communication Protocols, M2M Communication, Networking Hardware, Networking Protocols. **Sensing, Actuation, Basics of Networking:** layered architecture,	3	CO 1, CO 2	Lecture with Ppts	Understand	Quiz End Term Internals: Short Answers

	important protocols (MQTT, CoAP, REST, XMPP, AMQP)					
2	**IoT System Management:** Network Operator Requirements, IoT Platform Design Specification – Requirements, Process, Domain Model, Service, IoT Level, Function, Operational view, Device and Component Integration, Application development.	3	CO 2	Lecture with Ppts	Understand	Short Answers
3	**Networking and Computing** : File Handling, Python Packages for IoT, IoT Physical Servers – Cloud Storage Models, Communication APIs.	3	CO 2, CO 3	Lecture with PPTs	Understand	Short Answers
4	**IoT Clouds and Data Analytics** : RESTful Web API, Amazon Web Services for IoT, Apache Hadoop, Batch Data Analysis, Chef, Chef Case Studies, Puppet, NETCONF-YANG	3	CO4	Lectures with PPTs	Understand	Short Answers
5	**IoT Applications and case study Broad categories of IoT applications**: Consumer IoT, Commercial IoT, Industrial IoT, Infrastructure IoT, Military Things (IoMT) , IoT Case studies: Home automation with IoT, River water pollution monitoring, Smart city street light control and monitoring, Health care monitoring, Voice Apps on IoT device	3	CO5	Lecture Case Activity	Understand	Short Answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Kamal, R.,	”Internet of Things – Architecture and Design Principles,”	” 1st Edition,	Mcgraw Hill,2017
2	Simone Cirani	” Internet of Things-Architectures, Protocols and Standards”,		WILEY,2018
3	Alessandro Bassi,	” Enabling Things to Talk-Designing IoT solutions with the IoT Architectural Reference Model”		Springer,2013

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm

MOOCs:

ResourcesNo.	Websiteaddress
1	https://nptel.ac.in/courses/106/105/106105166/

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-(10) A**	**Introduction to Big Data**	
	Prepared By	**Dr. Dhanashri Vinay Sahasrauddhe**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

Learner will understand and learn –

- Various concepts of big data and its applications
- Decision making techniques
- AI concept and various techniques used in AI
- To apply decision making techniques for different use cases

CourseOutcomes:

CO1 : Understand Meaning of Big Data, its related concepts and various security issues of Big Data
CO2 : Understand role of big data and data scientist in decision making
CO3 : Learn to analyzebig data
CO4 : Understand role of Big Data in AI
CO5 : Apply various Decision Making tools for various use cases

Unit No.	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction:** Big Data History, The Big Data Business Opportunity-Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data, **Big Data In Organization:** Data Analytics Lifecycle, **Data Scientist Roles and Responsibilities** – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.	6	CO1, CO2	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Decision Theory And Strategy:** Business Intelligence	6	CO1, CO2, CO5	Lecture with Ppts Case Study	Understand	Quiz, Short Questions End Term:

	Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, **Strategy for Decision Making**- Big Data Strategy Document, Case Study -**Value Creation Process:** Understanding Big Data Value Creation, **Michael Porter's Value Creation Models:** Michael Porter's Value Chain Analysis, Case Study.			Psychometric Tools		Applied Questions
3	**Big Data User Experience:** The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience, **Big Data Use Cases:** 1. Research Business Intiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas, 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.	6	CO1, CO2, CO3, CO5	Lecture with PPTs Case Study	Understand, Analyze	Case Study, End Term Exams: Case based Questions/Applied Questions
4	**Introduction To Business Intelligence Applications:** Introduction to Big Data, Business Intelligence Data Mining, and Data Warehousing, What are Business Intelligence Applications (BIA). Features of BIA.**Sales, Finance And Marketing:** Introduction to Sales, Finance and Marketing Concept, **Education And Learning:** Introduction to Education System, Learning Concept.	6	CO1, CO2, CO3, CO5	Lectures with PPTs	Understand, Apply	End Term Exam: Short case based questions
5	**Vertical AI Applications:** Overview of AI, What is Vertical AI, Features of Vertical AI, Use of Business	6	CO2, CO4	Lecture	Understand, Apply	End Term Exam

	Intelligence in Vertical AI, Case Study.					
6	**Security:** Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.	6	CO1	Lectures with PPTs	Understand	Short Answers
7	**Lifescience** Introduction to Life Science, Life Science Intelligence, Features of Life Science Intelligence, Use of Life Science Intelligence in Decision Making, Case Study.	6	CO1, CO2, CO5	Lectures with PPT	Understand, Apply	Short Answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Bill Schmarzo	Big Data- Understanding How Big Data Power Big Business		
2	John Boyer, Bill Frank, Brain Green, Tracy Harris	Business Intelligence Strategy		

Online Resources

OnlineResourcesNo.	Websiteaddress
1	Edureka lectures **Link:-**https://www.youtube.com/watch?v=A02SRdyoshM

MOOCs:

ResourcesNo.	Websiteaddress
1	NPTEL / Swayam,
2	www.coursera.com
3	www. edx.com

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE-(10)B**	**Business Intelligence Tools with HADOOP**	
	Prepared By	**Dr. Dhanashri Vinay Sahasrauddhe**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

The learner will learn to –

- Use advanced functions from Excel
- Using BI as a tool for decision Making
- Using Hadoop in decision making and managing Big Data

CourseOutcomes:

CO1 : Understand the Big Data Concept and HADOOP tool for Business Intelligence.
CO2 : Apply Advance Excel Functions (like Optimization) on Big Data for decision making.
CO3 : Apply decision techniques to Case Studies in BI.
CO4 : Analyzing data using HADOOP Tool.
CO5 : Managing the Big Data using HADOOP.

Unit No.	Contents	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction To Big Data and Business Intelligence** Overview of - Data Mining, Data Warehousing, Big Data, How Business Intelligence is useful for Big Data, Big Data Problems. Introduction to BI, **Data Cleaning-**Editing a Workbook, Data Cleaning Using Text Functions, Using Validation To Keep Data Clean, **Working with Multidimensional Data-** Pivot Tables, Pivot Charts.	6	CO1, CO3, CO4	Lecture with Ppts Quiz	Understand, Apply	Quiz End Term Internals:Short Answers
2	**Applications of Business Intelligence and Excel Tools** CRM Domain, Banking Domain, Health Care Domain, Mobile Industry Domain, Creation of a New Product, Providing Personalized Services, **Optimization**	6	CO2, CO3	Lecture with Ppts Case Study	Apply (Analyse)	Case Study End Term: Applied Questions

	Modeling With Solver: Introduction to MS-Excel and MS-Excel Formulas,Understanding Optimization Modeling, Setting Up a Solver Worksheet, Solving an Optimization Modeling Problem, Reviewing the Solver Reports, **Working With Solver:** Working With the Solver Options, Setting a Limit on Solver, Understanding the Solver Error Messages, Case Studies (Solver Problems).					
3	**Advance Excel Tools: Using Shared Work Books-** Sharing a workbook, Opening and editing a shared workbook, Tracking changes, Resolving conflict in a shared workbook, Multiple workbooks- Linking workbooks, Editing the Link, Consolidating the workbook.	6	CO2, CO3,	Lecture with PPTs Case Study	Analyze	Case Study with Presentations End Term Exams
4	**Working With Macros:** Introduction to Macros? Where are Macros, Features of Macros, **Working with Macros-** Display the developer Tab, Changing Macro security Settings, Recording and running a Macro.	6	CO3	Lectures with PPTs	Evaluate	Group Activity End Term Exam: Short case
5	**Introduction To HADOOP:** Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop. **HDFS Overview:** Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.	6	CO1, CO4, CO5	Lecture Case Activity	Understand Apply	Case Presentation Activity End Term: Theory Applied
6	**MAPREDUCE:** What is MapReduce?,The	6	CO4, CO5	Lectures with PPTs	Understand, Apply	Activity End Term:

	Algorithm for MapReduce, Inputs and Outputs (Java a Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way. **Introduction To Hadoop Features:** New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.					Short Answers and Case study
7	**Multi Node Cluster:** Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster. **Environment Setup:** Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.	6	CO1, CO4, CO5	Lectures with PPTs	Understand, Apply	Activity End Term: Short Answers and Case study

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	John Walkenbach,	Excel 2010 Bible	2010 Edition	John Wiley & Sons

Online Resources

OnlineResourcesNo.	Websiteaddress
1	*https://www.talend.com/*,
2	www.coursera.com
3	Tutorials Point for advance Excel Tools
4	*https://office.live.com/start/Excel.aspx*
5	www.tutorialspoint.com

6	NPTEL / Swayam
7	www. edx.com

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
III	**ELE-(11)A**	**Introduction to Information Security**	
	Prepared By		
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100
Pre-Requisites :			
• Information about computer hardware, system and application software, and networking			
CourseOutcomes:			
CO1: RememberConcepts involved in information systems **CO2:** Understand Security concerns involving information systems **CO3:** Understanding of concerns to improve information security **CO4:** Analyze Real-life scenarios with respect to information systems **CO5:** EvaluateScenarios involving information systems and security concerns **CO6:** Create Information security awareness to address real-world scenarios			

Unit	**Contents**	**Sessions (Hrs)**	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Information Security Concepts ▪ Confidentiality, Integrity and Availability of Information ▪ Identification, Authentication and Authorization ▪ Security Principles and Models		**CO1**	Lecture with Ppts Quiz	Remember	Quiz End Term Internals: Short Answers
2	Physical Security ▪ Facility Requirement ▪ Perimeter Security ▪ Fire Protection ▪ Fire Suppression ▪ Power Protection ▪ General Environmental		**CO2**	Lecture with PPTs Case Study	Understand (Analyse)	Quiz End Term Internals: Short Answers

	Protection Equipment Failure Protection					
3	Network Security ▪ Secure Network design ▪ Firewalls ▪ WLAN Security ▪ VPNs Types and Sources of Network Threats		**CO3**	Lecture with PPTs Case Study	Apply	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	Operating System Security ▪ Windows Linux/UNIX		**CO4, CO5**	Lecture with PPTs Case Study	Analyze, Evaluate	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
5	Database Security MS SQL		**CO4, CO5**	Lecture with PPTs Case Study	Analyze, Evaluate	Quiz End Term Internals: Short Answers
6	Web Application Security ▪ Web Application Vulnerabilities ▪ Secure Coding Techniques Continuous Security Testing and Assessments		**CO4, CO5**	Lecture with PPTs Case Study	Analyze, Evaluate	
7	Compliance Standards ▪ IT Act ▪ ISO 27001 ITIL Framework		**CO6**	Lecture with PPTs Case Study	Create	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions

Text Book	Shimonski R., *Certified Ethical Hacker - Study Guide*, Sybex
Reference Book	Lammle T., *CCNA - Routing and Switching - Complete Study Guide*, Sybex
Supplementary SWAYAM Course	Cyber Security (https://swayam.gov.in/nd2_cec20_cs15/preview)

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**ELE - (11) B**	**Information Security Threats and Mitigation Strategies**	
	Prepared By	**Mr. DhankumarWadar**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To prevent data breaches and identity theft by safeguarding sensitive information from hackers, cybercriminals, and other malicious actors.
- To ensure business continuity and resilience by minimizing the impact of cyberattacks on the operations, reputation, and finances of organizations.
- To comply with legal and regulatory requirements by adhering to the standards and best practices of cyber security governance, risk management, and compliance.
- To promote innovation and competitiveness by enabling the safe and secure use of emerging technologies and digital services.

CourseOutcomes:

CO1: Understanding the Fundamentals of TCP/IP, Operating System Web Application and Database, Ethical Hacking.

CO2: Understanding the concept of Footprinting, Advanced Google Hacking, Nmapping the network, Fingerprinting

CO3: Understanding the Hacking of Networks, Servers and Database and Password Cracking.

CO4: Understanding the Hacking of WLANs, Web Application and Web Browsers and Evading IDs and Firewalls.

CO5: Understanding the concept of Social Engineering and Types of Attacks.

CO6: Understanding Cryptography, Encryption and Decryption, Cryptographic Algorithms, Digital Signature, Cryptography Tools and Cryptography Attacks.

CO7: Understanding different Types of Malware Attacks Like Viruses, Worms and Trojans

Unit	CONTENT	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Information Security Threats** TCP/IP Fundamentals Operating System Fundamentals Web Application and Database Fundamentals Introduction to Ethical Hacking Advanced Persistent Threats	07	CO 1	Lecture with Ppts/practical's	Understand	Long Answers
2	**Information Gathering** Footprinting Advanced Google Hacking Nmapping the network Fingerprinting	07	CO 2	Lecture with Ppts/practical's	Understand	Long Answers
3	**Exploitation** Hacking Networks Hacking Servers Hacking Databases Password Cracking	07	CO 3	Lecture with Ppts/practical's	Understand	Long Answers
4	**Advanced Exploitation** Hacking WLANs Evading IDS, Firewalls Web Application Hacking Advanced Web Hacking Hacking Web Browsers	07	CO4	Lecture with Ppts/practical's	Understand	Long Answers
5	**Social Engineering** Introduction to Social Engineering Common Types of Attacks Online Social Engineering	05	CO5	Lecture with Ppts/practical's	Understand	Long Answers
6	**Cryptography** Introduction to Cryptography Encryption and Decryption Cryptographic Algorithms Digital Signature Cryptography Tools Cryptography Attacks	05	CO6	Lecture with Ppts/practical's	Understand	Long Answers
7	**Malware Attacks** Viruses Worms Trojans	05	CO7	Lecture with Ppts/practical's	Understand	Short Answers

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1	Dan Kusnetzky	"Virtulization" – A Manager's Guide	2010	O'reilley Publications
2	Bernard Golden	"Virtulization for Dummies"	2007	Wiley

Online Resources

OnlineResourcesNo.	Websiteaddress
1	http://www.geeksforgeeks.org
2	http://www.thinkitsolutions.com
3	http://youtu.be/tPtrk-OV3VO?si=-LmAiS2KPxtei1y

MOOCs:

ResourcesNo.	Websiteaddress
1	http://onlinecourse.nptel.ac.in
2	swayam.gov.in

Programme:MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
III	**(12)A**	**Data Management Environment**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

CourseObjectives:

- To practice the application of the concepts related to data management.
- To make students familiar with data management

Course Outcomes:

CO1: Able to describe the basic concepts, data management
CO2: Able to interpret the data
CO3: Able to solve the data requirement on understanding the case
CO4: Analyzing the data quality
CO5: Ability to judge functionality of data management
CO6: Design data management model with proper validation

Sr.No		Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction To Data Management** Meaning of data management, need of data management , data management process, big data ,data management system components.	8	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Data governance** Data governance meaning , importance , objectives of data governance, Introduction to Data Governance Tools , concept of data asset, types of data assets, concept of data steward,	8	CO 2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied Questions
3	**Data Warehousing and Business Intelligence Management**	8	CO2 CO3	Lecture with PPTs Case Study	Analyse	Case Study with Presentations

	Business intelligence, OLAP ,Data mart, Data mining, Data movement (Extract, transform, load), Data warehouse					End Term Exams: Case based Questions/Applied Questions
4	**Document, Record and Content Management** Meaning of Document management, document management system, Record management, Meaning of content management ,content management process.	8	CO4	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions
5	**Database Maintenance** Data maintenance, its need, database administrator (DBA) ,DBA role ,data base administration system, Database management system.	8	CO4	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	**Data Architecture ,Analysis and Design** Data analytics, data architecture, data modeling ,types of data modeling , data modeling techniques.	8	CO5	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied
7	**Data Quality Management** Data cleansing ,data integrity, data enrichment, data quality parameters, data quality assurance , Capability maturity management, Data maturity model(DMM), genuine capability	8	CO6	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1.	DAMA-DMBOK:	Data Management Body of Knowledge	DMBOK (2nd Edition) ,	Technics Publications LLC
2.	Alex Berson, Larry Dubov	Management and Data Governance	McGraw-Hill Publications	McGraw-Hill Publications

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.dqlabs.ai/blog/what-is-data-quality-management/
2	https://www.geeksforgeeks.org/data-architecture-design-and-data-management/

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam

Programme: MCACBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**CourseCode**	**CourseTitle**	
IV	**(12)B**	**Industrial Data Management and Security**	
Type	**Credits**	**Evaluation**	**Marks**
DSE	3	IE	100

Course Objectives:

- To familiarize students to different types of data management and industrial data security

CourseOutcomes:

CO1: To Memorize data hiding and data security concepts

CO2:To Understanding need of data management and security

CO3:To Identify data security threats and application of security tools

CO4:Analysis of data management

CO5:Evaluation of threats and application of security measures

CO6:Creation of protective environment for sharing industrial data

		Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Reference and master data management** Meaning of Reference data, importance of reference data management , reference data management process, reference data evaluation criteria ,data integration, master data management	8	CO 1	Lecture with Ppts Quiz	Understand	Quiz End Term Internals:Short Answers
2	**Meta Data Management** Meaning of Meta-data, Need of Meta data management, Metadata discovery, Metadata	8	CO 2	Lecture with Ppts Case Study Psychometric Tools	Apply (Analyse)	Case Study , Newspaper Article End Term: Applied

	publishing, Metadata registry					Questions
3	**Contact Data Management** Business continuity planning ,marketing operations, Customer data integration, identify management ,identify theft , address(geography),postal code, email address, telephone number.	8	CO 3	Lecture with PPTs Case Study	Analyse	Case Study with Presentations End Term Exams: Case based Questions/Applied Questions
4	**Industrial Automation of Management Processes** Management processes and its interdependence ,Need of automation of management processes in industries, ERP software ,CRM software, introduction to SAP	7	CO4	Lectures with PPTs Group Activity Video Cases	Evaluate	Group Activity End Term Exam: Short case and situation based questions
5	**Industrial Data Security** Meaning of Data security ,need of industrial data security , four key issues in data security, Data access, data erasure, data privacy, data security, data security technologies , data security Vs Data privacy.	7	CO5	Lecture Case Activity	Create	Case Presentation Activity End Term: Theory Applied
6	**Industrial Data Security Threats and management** **Threats in data security, Industrial information security threats , Data Protection Practices-operational and technical ,industrial security threats/risks and mitigations for industrial network control system.**	7	CO5	Lectures with PPTs Flip Classroom	Evaluate	Activity End Term: Theory Applied
7	**Advanced data security tools** Wireshark, Kali linux,	7	CO6	Lectures with PPTs Flip	Evaluate	Activity End Term: Theory

	John the ripper,metasploit,cain and abel etc..			Classroom		Applied

Reference Books

Sr.No.	NameoftheAuthor	TitleoftheBook	Year Edition	Publisher Company
1.	DAMA-DMBOK:	Data Management Body of Knowledge	DMBOK (2nd Edition) ,	Technics Publications LLC
2.	Alex Berson, Larry Dubov	Management and Data Governance	McGraw-Hill Publications	McGraw-Hill Publications

Online Resources

OnlineResourcesNo.	Websiteaddress
1	https://www.integrate.io/blog/top-data-security-tools/
2	https://zapier.com/blog/contact-management/

MOOCs:

ResourcesNo.	Websiteaddress
1	Alisons
2	Swayam